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ABSTRACT

The policies and performance of the post-Mao Chinese government (1976 to the present) in the four modernization areas of industry, agriculture, science and technology, and the military are examined. Realizing that the program to modernize the economy of the People's Republic of China, which was initiated by Mao's successors in 1977, was much too ambitious, the current Chinese leadership is in the process of adjusting, reorienting, and retrenching the four modernizations into something more pragmatic, realistic, and attainable. Included among the topics are: economic growth; major developments in the Chinese economy since Mao's death; how the Chinese transportation network has been expanded to meet economic needs; population growth and control; the different economic and social roles of the urban and rural labor forces; why Chinese modernization has not entailed urbanization; how key industries are adjusting to meet the needs of modernizing China; plans for reforming industry; rural industrialization; agricultural productivity; science and elitism; Chinese attitudes towards technology transfer; whether or not military modernization has remained in its position as last in priority; and resource allocation for the military. (RM)

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CHINA UNDER THE FOUR MODERNIZATIONS

Part 1

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SELECTED PAPERS

SUBMITTED TO THE

JOINT ECONOMIC COMMITTEE
CONGRESS OF THE UNITED STATES

AUGUST 13, 1982

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LETTERS OF TRANSMITTAL

JULY 27, 1982.

To the Members of the Joint Economic Committee:

I am transmitting for the use of the Joint Economic Committee, Congress, and the interested public a compilation of papers assessing the economy of China entitled "China Under the Four Modernizations, Part 1." This compilation contains current information and analyses of China's recent economic performance and changes in policy with respect to the domestic economy. A companion volume covering China's foreign economic relations will be transmitted in the near future.

We are grateful to the Congressional Research Service of the Library of Congress for making available the services of John P. Hardt, who helped plan the scope of the research and coordinated and edited the contributions. Dr. Hardt was assisted by Kate T. Tomlinson of the Congressional Research Service staff. The project was supervised for the Joint Economic Committee by Richard F. Kaufman.

The views contained in this study are not necessarily those of the Joint Economic Committee or of individual Members.

Sincerely,

HENRY S. REUSS,
Chairman, Joint Economic Committee.

JULY 20, 1982.

Hon. HENRY S. REUSS,
Chairman, Joint Economic Committee,
Congress of the United States,
Washington, D.C.

DEAR MR. CHAIRMAN: Transmitted herewith is a volume of studies on the Chinese economy entitled "China Under the Four Modernizations, Part 1." The studies were written by specialists who were invited to contribute because of their expertise about China. The authors come from universities, research organizations, and agencies of the Federal Government.

Views expressed in the papers are those of the individual authors and do not necessarily represent the views of their organizations or of members of the Joint Economic Committee.

Sincerely,

RICHARD F. KAUFMAN,
Assistant Director, Joint Economic Committee.

FOREWORD

By Chairman Henry S. Reuss

China's economic policy has been significantly modified in the past several years to deal with problems not anticipated by the group that came to power after the death of Mao Zedong in 1976.

The post-Mao government's economic objectives were ambitious. In the period 1977–85, grain production was supposed to grow from 300 million tons to 400 million tons, steel production from 24 million tons to 60 million tons, and oil production from 2 million barrels per day to 5 million barrels per day. Rapid industrial expansion was to be achieved through increased investment, especially in heavy industry. Agricultural expansion was to take place through a kind of "Great Leap Forward" by the peasantry, unimpeded by the Gang of Four. China was to advance in accordance with the policy of "The Four Modernizations"—in industry, agriculture, science and technology, and defense, in that order. While the slogan and the priorities with respect to major sectors have not changed, economic policy along with Western hopes for expanded trade has become more realistic.

The question is whether the new policies, which give greater weight to agriculture, consumers' goods, transportation, and light industries, and which attempt to increase the role of market forces, will work.

The specialists who contributed to this volume are cautiously optimistic about China's prospects. China's overall performance, as Arthur G. Ashbrook states, is characterized by "strong but erratic economic growth." Most importantly, China is one of the few developing nations that have avoided massive foreign debt.

On the other hand, China faces serious economic problems. Agricultural production is barely keeping up with the population. Oil production peaked in 1979 and has been declining, and energy can be expected to be a constraint on growth for the next few years. The defense burden has been rather moderate, outlays having been reduced or kept level in the past several years. But there are pressures to increase defense allocations. Such a change in policy could have serious consequences for the economy.

In 1981, the Chinese economy grew by about 3 percent, compared with the 5 percent forecast by the government. Agriculture grew surprisingly well. Total farm production increased by nearly 6 percent over the previous year. Industrial production was mixed. The light, consumer-oriented industries grew by 14 percent, but heavy industrial production declined by nearly 5 percent. The energy sector was an unmitigated failure. Production of both coal and oil declined for the second straight year. China has a great potential for producing coal. It holds the third largest proven coal reserves in the world. But the coal industry is inefficient and lacks the modern machinery, equipment, and rail transportation to reach its potential. Robert Michael Field and

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Judith A. Flynn, authors of an essay on energy, conclude that poor performance in this sector will slow industrial growth to between 3 and 5 percent per year through 1985. In contrast, industrial growth averaged 9.6 percent in the period 1975–80.

Priorities were shifted from heavy industry to agriculture and the consumer sector because the prior policy was not working. A policy of balanced growth and "consumerism" was substituted for a Stalinist big push development approach. Wage increases and concessions to the peasants have succeeded in raising per capita disposable income. At the same time, inflation, unemployment, and industrial bottlenecks have been increasing and raise the possibility, as Robert F. Dernberger writes, that "the current emphasis on increasing the rate of consumption and the standard of living may only be a temporary or one-time shift aimed at alleviating neglect over the past decades." At some point, it must be supposed, industrial and military interests will increase their influence in Beijing.

In sum, recent economic and political trends in China have been very favorable to the United States. Since 1977, our volume of trade with China has increased dramatically and our political relations have improved greatly. These improvements are now somewhat threatened by China's present precarious economic situation. Although China has so far managed to adjust to the disappointing results of its earlier policies and the unfavorable developments in the world economy, new setbacks could prove to be disruptive to both China's internal development and its developing external relations. Our own policies ought to be designed to foster China's efforts to achieve balanced economic development and to strengthen, not jeopardize, our relations.

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SUMMARY

By John P. Hardt

I. MODERNIZATION: A ROCKY COURSE

The determination to modernize the economy of the People's Republic of China on the course initiated by Mao's successors in 1977 continues.

The drive toward normalization of China's economic relations with Japan, the United States and the other advanced industrial economies is resulting in increasing degrees of interdependence.

However, the Four Modernizations, the program for modernizing agriculture, industry, science and technology, and defense has undergone considerable changes since it was first announced in 1977. Having realized that it was much too ambitious, given China's current capabilities, the leadership is in the process of adjusting, reorienting and retrenching the Four Modernizations into something more pragmatic, realistic and attainable. The main lines of the modernization program still obtain, but the adjustment may occupy much of the decade of the 1980s:

> Economic development is still the overriding imperative, but the reliance on costly major projects is being reduced. For example, the mammoth, modern Baoshan iron and steel complex is being scaled down to a more attainable size and schedule.
>
> Although implementation of economic reforms such as decentralization of planning and the introduction of incentives continues, efforts have been made to retain necessary central control and economic stability.
>
> Western systems and processes are still important, but the measuring rod for China's modernization is no longer the acquisition of the most advanced Western technology, but a judicious blend of foreign experience and self reliance.
>
> Improvement in living conditions is still an important goal, but the earlier expectation that China could rapidly move beyond meeting the subsistence requirements of its citizens must be tempered.

Uncertainty about the effectiveness and permanence of the adjustment persist. Retrenchment may yet become reversal. Leadership changes may resurface at least some of the old ideological priorities evident during the Cultural Revolution and the Great Leap Forward. Likewise, the priority of the fourth modernization—that of the military—may rise and threaten the preeminence of the other three.

The normalization of economic and political relations with Japan, the United States and other advanced Western economies continues to contribute to modernization. But, normalization has also been reassessed and adjusted:

Western imports for major projects have been cut back in accordance with China's limited hard currency reserves and special technological requirements.

Institutions, legal systems, market practices are still in a state of flux. While Western practices are emulated, they are also being adapted to China's special circumstances and needs.

Barriers to Western economic relations such as expropriation claims, political constraints and tariffs and credit restrictions continue to be reduced, but the full use of Western business and governmental banking facilities is pursued at a more measured, selective pace.

Just as political stability is critical to modernization and normalization, adjustment of Chinese modernization and normalization is critical to political stability and economic growth in the P.R.C. Opportunities for Western exporters in the China market, business facilitation, financial mechanisms, and legal facilities all turn on the pace and character of normalization. Once again Western exporters have seen through the "oil for the lamps of China" mirage and adopted more modest expectations for new and profitable China markets. Chinese planners, in turn, have scaled down their plans to fit technical and financial possibilities.

Military modernization may, in turn, benefit from the widened prospects for American military sales. Still, limited Chinese hard currency reserves as well as continued American caution may preclude any substantial flow of arms from the United States to China.

II. FUTURE MODERNIZATION UNCERTAINTIES

Prospective improvements in the economy of the People's Republic of China may bring problems as well:

1. The post-Mao leadership has given high priority to economic modernization, professionalism, and incentive systems in planning and management. The PRC's need for Western products and processes has created an opening for greater influence and a favorable environment for closer commercial ties with Japan, the United States, and other Western industrial economies.

2. The rapprochement between the United States and the People's Republic of China has been followed by increasing political, commercial, scientific, social, and other relations. Commercial relations have expanded due to China's stated needs for Western technology. Limited oil revenues and a more restrictive attitude toward credit suggest constraints on wider commercial ties in the future. Since our continuing ties with and arms sales to Taiwan are serious barriers to rapid improvement in political and military relations, improved economic ties may be the most attractive avenue for improving Sino-American relations for the immediate future.

3. The leaders of the PRC have given priority to economic modernization. Although the purchase of foreign military technology is part of China's current long-term policy, Western influence is still likely to be greatest in relation to China's economic needs. In spite of the possibilities for progress in controlling population growth, the Malthusian specter still looms in China's fu-

ture. Transfers of agricultural technology from the West may be critical for the long run. Although only marginally significant in the short run, imports of grain may at times provide a critical margin.

4. Effective planning and management turn on accurate and timely information. The poor quality of statistical processing in the past, especially during the Cultural Revolution, poses problems for Chinese planners and makes it difficult for Western analysts to evaluate the Chinese economy's prospects. In recent years, modest, but significant, improvements in the quantity and accuracy of published economic data, empirical evidence from exchanges, and substantially increased Western access to the end users of Western imports have aided Western analysts in appraising China's economic policy and performance.

It is difficult to separate long-term or cyclical trends from variable or temporary factors in performance. Nonetheless, it seems clear after three decades of power that Chinese leaders aim to develop a modern, powerful, industrial state that would be capable of dealing on equal terms with the superpowers, while providing adequately for its citizens' needs. The current Chinese development plans, however, are not characterized by the Stalinist urgency to overtake and surpass the West in a short, definite time period—a goal the Chinese themselves expressed during the period of the Great Leap Forward.

Against this long-term aim of achieving an economic basis for superpower status, from time to time China has pursued political, ideological, and social policies that derailed the progress of economic nation-building in the short-term. These policies threatening the primacy of economics may re-emerge in the years immediately ahead and influence economic performance:

Political succession.—Inevitably, the 79-year-old Deng—the architect of and the power behind China's current policies—will be challenged or die. Efforts at installing successors to Deng will lead in all likelihood to an unsettling struggle rather than an orderly transfer of power.

Revival of ideological preeminence.—There have been times such as the Great Leap Forward and the Cultural Revolution when the emphasis on ideological revitalization conflicted with policies to improve economic performance. If this experience is repeated, stable long-term growth may be jeopardized. To assume that no recurrence of these economically disturbing political-ideological cycles is likely is, on the one hand, to assume that cycles in the past were primarily due to the unique force of Mao's personality and, on the other hand, to de-emphasize the broader base of support for the "Yenan" revolutionary spirit in the Party and nation as a whole.

Foreign threats or opportunities requiring more weapons and military forces.—Concern about the Soviet Union may at any time lead to a major shift in Chinese military policy or a force buildup. In addition, Peking might well become more actively involved in supporting Asian Communist powers if circumstances were different, despite present indications of military restraint.

III. UNCERTAINTY OF THE FUTURE

Modernization of the Chinese economy launched with such high hope and expectations in 1977 has run into rough sailing. Adjustment, reorientation, and retrenchment have been necessary almost from the outset. Yet important progress has been made and significant changes have been initiated.

The achievement of a modern, industrial, competitive economy by the People's Republic of China is not certain for any particular future year, certainly not for the year 2000. However, China has the resource potential, the skills and the will to change. A formidable task lies ahead, but success should not be ruled out.

Joining the economic powers of the region and the world may be some time off for the People's Republic of China. China has launched modernization. The Western nations have adopted a policy of "normalization", accepting China into the global family of economies. Active and equal participation by China as an industrial nation in the world market is some years off.

IV. CONTRIBUTORS' INSIGHTS ON CHINESE MODERNIZATION AND NORMALIZATION

The authors of the chapters in this volume are American specialists on China. Many have drawn on recent experience in the People's Republic of China. The cooperation of Chinese officials and citizens and the authors' access to key people and institutions in the major cities and in the countryside have greatly enhanced the quality of insights. The interest of Chinese officials and scholars in previous volumes on the Chinese economy released by the Joint Economic Committee contributes to U.S.-P.R.C. cooperation and mutual understanding. This interest is evidenced by the publication of complete official Chinese translations of previous volumes in large editions, which nave been widely distributed in the People's Republic of China.

Some of the major questions addressed in the studies in both volumes, and indications of some of the authors' responses are illustrated below:

1. *Is the current leadership committed to putting the economy of the People's Republic of China on a path of stable, continuous economic growth? Does this new course amount to an irreversible change from past development policy?*

> Deng Xiaoping has led the right-wing survivors of the two-line struggle in their steady rise to power within the post-Mao leadership over the years since the death of Mao and the overthrow of the Gang of Four in 1976. This new or post-Mao leadership is dedicated to reestablishing China's economy on the path of sustained growth during the 1980s as a necessary precondition to the long-run achievement of the Four Modernizations. In their search for the path of sustained growth the post-Mao leadership has introduced a whole series of new economic policies and reforms made necessary by the economic problems, policies, and institutions they inherited from the past. . . . [T]he post-Mao economic program is the result of a continuous process of experimentation in their search for the path of sustained growth; a process which has encountered problems and undergone several twists and turns, but which is likely to continue throughout the 1980s.
>
> Taken as a whole the post-Mao leadership's program of economic policies and reforms has become an across-the-board attempt to change the traditional Chinese development model. . . . [T]hey also have led to many favorable changes in China's economy that augur well for the attempt to regain self-sustained growth. [Dernberger, "The Chinese Search . . .," Vol. 1, pp. 19, 20.]

2. *How will the political dynamics of the post-Mao era influence future economic policy? Will political dynamics change the character of the Chinese development model formulated under Mao's rule?*

Some Chinese leaders have been particularly outspoken in arguing that sweeping political reforms are a prerequisite for an effective pursuit of the four modernizations.

The reforms include changes in Chinese laws, institutions and administrative practices, but at their heart are major leadership changes. Following the death of Mao and the arrest of the "gang of four" in late 1976, Chinese leaders inherited a massive administrative structure staffed by cadre seriously divided along ideological, generational, institutional and factional lines. Reformers like Chinese Communist Party (CCP) Vice Chairman Deng Xiaoping recognized that Chinese decision making on economic development and other programs would continue to be disrupted by such divisions unless they managed to establish a more unified and competent leading group at the top levels of the party, government and army. . . .

Prospects for solving these kinds of leadership differences appear uncertain. . . .

A cautiously optimistic scenario for the next few years holds that Chinese reformers will continue to make slow and halting progress toward the establishment of a more unified, pragmatic and technically competent leadership that will gradually develop a more coherent modernization program capable of eliciting more active support from Chinese officials and people. [Sutter, Vol. 1, pp. 77, 78.]

3. *What have been the major developments in the Chinese economy since Mao's death?*

1. After an initial burst of overoptimistic economic plans, the post-Mao government has brought its modernization goals in line with China's real needs and available resources.
2. The government has provided more inputs for the agricultural sector, raised farm procurement prices, and encouraged private plots and peasant markets.
3. Concurrently, Beijing has canceled or postponed major construction projects, particularly heavy industry projects with expensive foreign equipment.
4. The People's Liberation Army, while continuing to improve in weaponry and discipline, has had to accept a stretchout in its re-equipment program.
5. Scientists have returned to laboratory and classroom, universities have restored their admission standards, and gifted students have gone abroad to master Western technology.
6. The government has re-affirmed the clear-cut goal of the population control program—one child per family.
7. The consumption sector has gained new impetus from measures favoring agriculture, light industry, and small-scale handicraft and service enterprises.
8. The People's Republic has broadened its participation in the international economic system, joining the IMF and World Bank and seeking credits from a wider variety of sources.
9. These pragmatic programs will help offset factors pushing down growth rates in the 1980's, such as diminishing returns in agriculture, the overloading of transportation and communication facilities, the dearth of modern accounting and statistical methods, the apparent spread of cynicism and self-indulgence, and the drawbacks of a Soviet-type system for running an increasingly complex economy.
10. In particular, the recent peaking of oil production at 2 million barrels per day (plans had called for 5 million b/d by 1985) will dampen growth by reducing China's ability to buy foreign machinery and technology.
11. Because of the absence of a charismatic leader like Mao Zedong and the economy's development of deeper roots, political turbulence probably will disturb economic activity much less in the 1980's than in the first three decades of communist rule.
12. The huge population will remain the single most dangerous long-term threat to maintaining rapid growth; today's one billion Chinese will have increased by at least 200 million at century's end, even assuming the success of the government's population control program.
13. In short, while growth rates in China almost certainly will fall off in the remainder of the century, the new pragmatic policies will greatly reduce chances of a precipitous decline.

14. The People's Republic will realize substantial absolute gains in agriculture, industry, defense, and science and technology, while remaining far behind the standards of Japan and the leading Western nations. [Ashbrook, Vol. 1, pp. 100–101.]

4. *Has China's transportation network been expanded in the last decade to meet the burgeoning needs of the economy?*

China's transportation networks continued their remarkable growth during the 1971–1980 period. All the modern transport sectors—rail, road, water, air, and pipeline—set new records in freight handling; the traditional sector continued supplementing the modern sector by moving large quantities of goods over short distances. . . .

In spite of the impressive increase in freight turnover since 1970, China's transport systems at present are barely sufficient to meet economic development needs. In 1980, the railroads, carrying 50 percent of national freight turnover in the modern sector, remained the predominant form of transportation. However, the utilization of railroads is near saturation nationwide and in some areas is lagging behind transport needs. Water transport was second, handling 44 percent of the turnover volume. Here, the need for continuous dredging of waterways and harbors and for the modernization of ports and the inland fleet restricts expansion of inland water routes and development of harbors. With a limited number of only poor quality highway routes, the highway departments played mainly a supportive role to other sectors as road traffic accounted for only slightly more than 2 percent of turnover. In light of the recent slowdown in oil production, the pipeline sector, handling 4 percent of modern turnover, probably is the only sector not being pushed to capacity. For the air sector to significantly increase its contribution to the transportation infrastructure, cargo-handling facilities and internal transport system linkages will require modernization. [Peterson, Vol. 1, p. 139.]

5. *What are the likely ranges of population growth and how has China been controlling population growth? What are the problems and prospects of the new, upcoming census?*

A major change has taken place since 1978 in the availability of national and provincial population data from China and in the policies of the Chinese government toward statistics in general. . . .

Some of these data show a demographic impact from the food crisis of 1959–61 that is far more serious than most foreign observers had supposed. Chinese sources say that there was even a net loss of population in one or two of the years.

Other doubts are raised by the extremely rapid declines in fertility and natural increase in the country as a whole and in some of the provinces between 1970 and 1980. Recent Chinese sources have been quite candid in discussing widespread falsification of statistical data in China, and several say that births are deliberately underreported in order to show success in family planning work. . . .

Concern about the reliability of population data is one of the reasons why the Chinese leaders have decided to take a new census. But the census poses a threat of exposure to those local leaders who have falsified population data. The critical question is whether the census field procedures can be designed in such a way as to make sure that the census returns are immune from local manipulation before they are submitted for tabulation. . . . The census has attracted worldwide attention because it is the largest census ever undertaken and is expected to provide answers to many of the long unanswered questions about China's population. [Aird, Vol. 1, pp. 172–173.]

6. *The urban and rural labor forces of China are sharply different in terms of their economic and social roles. How does primarily rural collective labor differ from predominantly state-run urban labor?*

Since completion of the land reform and collectivization of agriculture and traditional trades and socialization of the modern sectors of industry, construction, transport, trade, and finance in the 1950's, employed Chinese have worked in either one or the other of two basic types of enterprise or organization, one a collective undertaking and the other a state-run organization. Upwards of 90 percent of the population of China works in (and are members of) collectives, which are predominantly (although not exclusively) rural, while the remainder work in state-run undertakings, most of which are located in urban areas. Collectives are responsible for their own profits and losses and, in general, are not eligible for investment made under the state plan or for any other form of state cash distributions, except for disaster aid. State-run undertakings, on the other hand, receive state subsidies, as needed, and investment made under state economic plans. . . . The state sector, representing less than 20 percent of the population, primarily urban and nonagricultural, receives almost all of the investment made under the state economic plans and almost all of the subsidized welfare and educational services and entertainment that the state provides, and is fed on what amount to state-subsidized rations of grain, edible oil, meat, and fish purchased from the rural peasant population usually at fixed prices set by the state. On the other hand, the more than 80 percent of the population, mostly peasants, that provides most of the labor used to produce the food consumed in China, receives very little in return, small amounts of cloth and other rationed items but very low social and welfare services. This situation can be viewed in several ways. One way is to think of it as as most of the peasant population supporting the favored few in the cities. Another is to consider the two sectors as two separate economies which have very few interconnections. Either way, it is perfectly clear that it costs the state much more to support one city dweller eligible for state grain and other rations than to maintain one peasant at a subsistence level of living.

Differences between urban and rural standards of living have preoccupied Party leaders ever since the completion of collectivization and socialization programs in 1957–1977. [Emerson, Vol. 1, pp. 235, 236.]

7. *Why has Chinese modernization not entailed urbanization, as has been the pattern elsewhere? Have the Chinese avoided the problems of urbanization common elsewhere?*

While modernization normally implies urbanization, China has been attempting to modernize without increasing the proportion of the population that lives in cities and towns. This may be a unique experiment in the history of nations and has required innovative approaches to many economic and social problems. Some have worked, some have failed, and some are still being tested. But while China is struggling with unemployment, pollution, housing shortages, land use, consumer services and innumerable other difficulties that stem from urban growth, Beijing does not know how many people live in the urban areas.

The experience of the People's Republic of China has been quite different from that of other developing nations. China's urban growth has had its ups and downs—periods of "blind infiltration" by the peasants and of forced evacuations—but over the past three decades China has been able to limit the flow of population into the cities and thereby has avoided some of the worst consequences of urban sprawl. She has not found any magic solutions, however, and "success" is only relative. Her urban problems may appear somewhat more manageable simply by virtue of controlled urban migration, but they are actually numerous and serious. In a sense, by "bottling up" the rural population, Beijing has spread a host of problems more evenly between town and village. And, in a sense, this was Mao's intention. [Orleans, Vol. 1, pp. 268, 270.]

8. *How are key industries adjusting to meet the needs of modernizing China? What kind of constraints and stimuli do energy supplies exert on Chinese economic growth?*

In the last four years, both Chinese and Western perceptions of the outlook for Chinese industry have changed drastically. At the National People's Congress in March 1978, Premier Hua Guofeng announced an ambitious ten-year plan for the modernization of the Chinese economy. Steel was expected to grow from 25 million tons in 1977 to 60 million tons in 1985, and the gross value of industrial output was planned to increase ten percent annually.

The Chinese felt the planned 10-percent rate was attainable because they attributed the poor industrial performance during the previous several years (especially 1974 and 1976) to political disruption. . . . Many Western economists recognized at the time that the targets of the ten-year plan could not be fulfilled by 1985, but neither they nor the Chinese planners had enough data to understand fully the nature and scope of the problems.

Even as these important limitations to growth were surfacing, a fundamental crack appeared in the foundation of China's modernization plan. Planners in Beijing—who were counting on continued high growth in oil output to fuel and finance the modernization program—found that oil prospects had been seriously overstated. In contrast to 10-percent annual growth they had anticipated, they were faced with the prospect of a decline in output. This rapidly emerging problem has led us to examine the impact of energy shortages on industrial output over the next five years.

We have concluded that energy constraints alone will slow the industrial growth rate to between 3 and 5 percent annually through 1985, compared with 9.6 percent in 1975–1980. Heavy industry will probably continue its downward drift through the mid-1980s, and even under the best of circumstances, will barely make up for the decline we anticipate in 1981. The tight energy supply, particularly of oil products, will probably force Beijing to intervene repeatedly in the allocation of fuel, implying strong central control.

This general pattern will persist until the energy shortage is relieved. [Field/Flynn, Vol. 1, pp. 335, 357.]

Construction of the Baoshan Steel Mill began in 1978 as a symbol of China's drive to develop one of the world's advanced industrial economies by the year 2000. The projected six million ton per year Shanghai-area plant was to be the linchpin in the expansion of the industry viewed as the key link in overall development. It was also designed to be a showcase example of gaining access to state of the art technology through cooperation with foreign companies.

By 1982, however, Baoshan has become synonymous with difficulties and setbacks encountered in the modernization drive, and with abandonment of goals and changes in priorities. . . . [M]ost of the controversy over the plant is connected with larger policy issues, such as what China's industrial priorities should be, and what role foreign companies should be allowed to play in China's economy. Above all, Baoshan's turbulent history shows how greatly economic planning and political struggle have affected each other.

In the final analysis, Baoshan has been an expensive failure. But at the same time, it signifies many potentially positive changes. The plant has driven home the need for thorough feasibility studies for major projects. It has contributed to the Chinese understanding that there is more to modernization than buying advanced technology. Finally, Baoshan's history suggests that China, to an extent without precedent in Stalinist command economies, may succeed in overriding the influence of the bureaucratic heavy industrial interests that have done so much to distort development patterns in Socialist countries. [Weil, Vol. 1, pp. 387, 391.]

In the last three years, the government of the People's Republic of China has released far more data on industrial performance than have been available since the 1950s. . . .

As more and more data have become available, the observer of the Chinese economic scene can answer hitherto unanswerable questions. Are the GVIO [gross value of industrial output] and physical output data consistent? Are the current figures comparable to those published in the 1950s? And do they accurately reflect the growth and change in industrial structure of the last three decades? . . .

The official and estimated branch of industry indexes for 1979 . . . [compiled by the author—Ed.] are remarkably close, despite the theoretical deficiencies of the official indexes and the practical shortcomings of the indexes that I estimated. For those industries producing relatively homogeneous goods—such as metallurgy, electrical power, coal, building materials and timber—and for the slower growing, more stable light industries—such as food products, textiles and paper—the data suggest that the official and estimated indexes are consistent. For the more rapidly growing petroleum, chemicals and machinery industries, however, the conclusion is not so clear. . . . Nevertheless, it appears that GVIO indexes are reasonably reliable measures of Chinese industrial output. [Field, Vol. 1, pp. 304, 312, 314.]

9. *What progress has been made in Chinese plans to reform industry?*

In the two years after December 1978, the People's Republic of China initiated a broad set of economic reforms. In December 1980, industrial reforms came to at least a temporary halt. . . .

By the end of 1980, more than 1600 of these so-called "specialized industrial corporations" or general plants had been formed in China, each controlling an average of ten plants. The corporation's function is to redistribute production processes among these plants in a more economically rational way.

This activity will undoubtedly succeed in garnering some universally obvious efficiencies. But the policy is not a part of true economic reform; indeed, in some ways it is reform's antithesis, a device for streamlining and facilitating continued central planning. . . .

Where does this leave us? The most that one can say is that fundamental reform is still on the agenda. [Reynolds, Vol. 1, pp. 119, 136, 137.]

10. *Rural industrialization is often described as a uniquely Chinese aspect of industrialization. How has it fared in recent years?*

[T]he rural industrialization program of People's Republic of China deserves close study. With over one million small-scale enterprises employing well over 20 million workers, the Chinese program is unparalleled not only in size, but also in innovativeness. Of special interest are the 600,000 enterprises in the "five small industries" of iron and steel, farm machinery, chemical fertilizers, cement and hydroelectricity. Using modified versions of technologies that were long ago obviated in the West, these small-scale, relatively labor-intensive plants constitute an important experiment in the use of intermediate technologies. At their peak, they produced major portions of output in these industries: in 1978, they accounted for almost all of the small and medium farm tools and machinery, over half of the chemical fertilizer (by weight), 65 percent of the cement, etc., that were supplied to the agricultural sector. . . .

While it is often impossible to isolate problems and attribute them exclusively to a single cause, we can nevertheless discern two distinct categories of problems afflicting the rural industrialization program. One category is discussed under the heading of "techno-economic" problems, which includes problems involving the viability of technologies used in the small-scale plants, choice of plant scale, and plant location vis-a-vis skill and resource supplies. The second is broadly termed "administrative," and it includes problems of policy, performance indicators, investment choice criteria, tautness of State plans, and coordination among decision-making units. [Wong, Vol. 1, pp. 395, 397.]

11. *How has agricultural modernization fared in the readjustment period? Will Chinese agriculture be able to meet rising consumer needs? How successful have programs for improved agricultural productivity been?*

Agriculture, long a weak link in China's economy, has a new and critical role to play in meeting China's evolving commitment to higher standards of living. This commitment is an important underpinning for the claims to legitimacy of the new leadership. It is also crucial to efforts to raise productivity and generate greater economic growth through more reliance on material incentives. The higher real incomes required by this commitment mean substantial new demands on agriculture on top of a backlog of unfulfilled demand accumulated in past years of economic stagnation. Failure to meet these demands will seriously compromise China's current drive for modernization and sustained economic growth.

China's agriculture at the beginning of the eighties appears positioned to grow somewhat faster than historical growth rates, at least through the mid-eighties. But no major breakthroughs in production are imminent. . . .

China's leadership is stressing productivity gains from new policies as the major stimulus to agricultural growth in the eighties. More decentralized decisionmaking, greater reliance on material incentives, and growing specialization and commercialization of agriculture are being counted on to increase the quantity of output that can be produced with available supplies of land, labor, capital, and current inputs such as fertilizer. These policies will have to be successful if growth rates are to rise. . . .

The increases that can be reasonably expected may be insufficient to meet the full range of demands on agriculture. A serious shortfall would generate pressure for further changes in agricultural policy and possibly for a reassertion of centralized control over agriculture. [Surls/Tuan, Vol. 1, pp. 419, 420.]

Chinese grain production can now be maintained at a level that supports an adequate basic diet. The problem the Chinese face now that they can feed themselves is improvement in the quality of the diet. China's present government gives high priority to raising personal incomes and living standards. Quality foods, especially meat, will be viewed by the Chinese as an important aspect of raising living standards. If per capita incomes rise, as they will if the Chinese are successful, increases in consumer demand for non-grain food products will press

China's agricultural production capabilities for the rest of this century. Recent increases in meat, oil and sugar supplies have begun to partially meet this demand but population growth and technical and resource limitations will make continued increases in per-capita supplies difficult. [Kilpatrick, Vol. 1, pp. 449–450.]

The main thrust of China's past strategy for agricultural development has been maximization of annual crop yields through further intensification of cultivation techniques. It is an emphasis which is broadly consistent with China's resource endowments—lack of unexploited arable land and surplus of labor. It also seems generally consistent with the peasants' goal of farm income maximization, because of an institutional framework in which labor is rewarded in workpoints rather than fixed wages and, at least in the past, a production technology which involved minimal dependence on the industrial sector. That is, the goals of the state and the peasant should be reasonably consistent.

But this consistency or harmony of objectives has unequivocably broken down in Suzhou Prefecture (an eight-county area in Jiangsu Province just west of Shanghai Municipality). The area is representative of the frontiers of high-yield, labor-intensive cultivation technology in the PRC. It is favored by natural conditions, abundant labor, developed mechanization, and a reliable irrigation and drainage system. . . .

The projections express a conviction that in Suzhou the Chinese strategy of yield maximization through intensification of cropping and labor use has at once reached its highest state of development and the end of the road. Further development of Suzhou agriculture means a retreat from this approach, and movement toward the kinds of modern agricultural practice found today in Japan, South Korea, and Taiwan. [Wiens, Vol. 1, pp. 462, 474.]

12. *How have the efforts to modernize science and technology fared in the post Mao period? What is the outlook for Chinese science and technology? What is the Chinese attitude towards technology transfer and how effectively do the Chinese assimilate Western technology? What is the Chinese approach to the Communist dilemma of choosing between "red" and "expert" and traditional Chinese problems of elitism? What is the status of professional economists in today's China?*

An enormous scientific and technological wave crested in 1977 and 1978, when, because science and technology were to spearhead the Four Modernizations, China announced some extremely ambitious goals that incorporated expensive projects and plans in a variety of fields. The wave hit on some contradictions in 1979 and 1980. Specifically, the authorities had disregarded shortages in scientific and technical manpower and serious financial constraints. They now admit that they were too impetuous, were deceived by "expectations for easy success," and had an "inadequate understanding of China's reality." Thus, the wave began to recede. But another wave of a different size and configuration is already cresting. Now Beijing maintains the basic problem in the past was a lack of coordination between scientific and technical work and economic work. Under the present policies of readjustment and reform, more attention will be devoted to the "problems of application and development in science and technology." There will be less basic research and much effort will be expended toward "absorbing foreign production techniques suitable to our own national conditions." To accomplish this task Beijing is insisting on much closer contacts between scientific research institutes and production enterprises.

The quick rise and recent downturn of the status of the Chinese scientist prompt some important questions. . . .

Can today's China accommodate a conspicuous return to the historical dichotomy between the man of learning and the rest of the society? . . .

A degree of scientific exclusiveness is a universal phenomenon—and up to a point it is supported and perpetuated by all of us. But why should the dichotomy between the man of science and the rest of society be greater in China than in the United States, for example? [Orleans, Vol. 1, pp. 475, 477, 478.]

The post-Mao drive for scientific and technological development, and the identification of science and technology (S&T) as key factors in the modernization of agriculture, industry and national defense, is thus but the latest reaffirmation of an elite recognition that reliable knowledge of the material world is essential for the transformation of China into a prosperous and powerful country. [Suttmeier, Vol. 1, p. 489.]

Noteworthy among the shifts in policy under the Four Modernizations drive are the positive sanctions now given to transfers of technology between the People's Republic of China (PRC) and the highly developed nations of the West . . . , underscoring the official line on the importation of technology: "We must also make use of foreign capital and technology and energetically develop foreign trade. However, we must emphasize self-reliance." [Wilson, Vol. 1, pp. 553, 568.]

China's ability to assimilate foreign technology is severely constrained by four factors: (1) uneven performance with respect to translating research results into the serial production process; (2) poor management capabilities, particularly in such areas as project integration and industrial organization; (3) technical backwardness, particularly in precision instrumentation and testing equipment; and (4) insufficient numbers of qualified S&T personnel to assist with the management and adaptation of imported technology. These problems are critical constraints in both the civilian and military sectors. Although the Chinese have made appreciable progress during the past several years at remedying many of their deficiencies, most of the above are deep-seated problems with long-term solutions. The Chinese must first upgrade their basic capabilities in such fundamental areas as alloy processing, computer and electronics development and applications, and systems management before imports of foreign technology will have an appreciable impact on their modernization program. [Simon, Vol. 1, p. 514.]

Economists and economics enjoy a dominant position among the social sciences in China's academic and research institutions. . . . Judged from the standards, methods, and objectives of contemporary Western economics, my impressions concerning the current state of academic training and research in the field of economics in the PRC lead one to a very pessimistic conclusion. This gap between the state of the arts in the field of economics between the two countries may be somewhat alleviated in the future. This can be achieved by the sending of Chinese students to study in the United States and other Western countries and by the sending of Western economists to China to give and hold seminars or joint conferences. It can also be furthered by the revival of imports of Western journals and books in the field of economics. However, the small scale of these activities and the limited extent to which they are grafted into the main stream of academic training and research in economics in China will, I believe, do little to close the existing gap in the near future. [Dernberger, "The Status of Economics . . .," Vol. 1, pp. 569, 577.]

13. *Has military modernization remained in its position as last in priority? Why is this and what does the future hold in terms of military priority in resource allocation?*

China's military modernization strategy thus seems to be one of delay, of suboptimization, of capitalizing on known assets and of balancing enemy against enemy. Thusly defined, China will probably continue to adhere to the requirements approach for the next several years (barring, that is, major political reorientation internally or large-scale conflict with the Soviet Union or its Vietnamese ally) . . . . If a prediction may be ventured, therefore, it is for relative stability of direction and pace of Chinese military modernization along lines by now clearly evident. [Robinson, Vol. 1, p. 596.]

China's defense modernization program, a two-decade effort aimed at improving the People's Liberation Army (PLA) and the defense industries, is making limited progress but has far to go. The effort arises from deep-rooted apprehension over Soviet military capabilities and from the leadership's desire to "move China into the front rank of nations" by the year 2000. It will be successful only if the nation enjoys prolonged political stability, retains access to foreign capital and technology, avoids costly foreign military campaigns, and moves forward in higher priority efforts to modernize agriculture, industry, and science and technology.

China's prospects for military modernization are influenced by strengths and weaknesses in its political, economic, and technical bases. The country suffers from a serious shortage of trained technicians and deficiencies in key technologies and defense industries. The principal factors favoring success of the modernization drive include the leadership's dedication to the program and the availability of foreign technical and financial assistance (to the extent that Beijing can pay for costly technology). [Jammes/Lamborn, Vol. 1, p. 597.]

China announced in February of 1981 the start of a program of "further economic adjustment" that calls for a reduction in the current national budget, including defense funding. The program also entails a restructuring of the economy toward light industry and a reemphasis on centralized investment decisions. In light of China's worsening economic situation, and the new economic program's shift in priorities away from defense-related industries, the cut in the defense budget may portend a period of lower defense spending lasting several years. [Mitchell, Vol. 1, p. 605.]

14. *How has the PRC's international economic policy changed under the post-Mao leadership? How have the major construction projects been related to foreign trade plans? How will hard currency income restrict imports? Japan, a natural Western trading partner, has expanded China trade. With what success? What is the future of the U.S. grain trade with China? What steps has China taken to join the international economic institutions: GATT, IMF, World Bank, etc.?*

In the five years since the death of Mao Zedong China's new leaders have moved the country unrelentingly toward greater participation in the world's economy. Beijing has dropped its ideological aversion to foreign debt, encouraged foreign investment in the domestic economy, established trade and diplomatic relations with the United States, joined the International Monetary Fund and World Bank, decentralized its foreign trade organizations to promote direct foreign contacts at the enterprise level, and sent thousands of students abroad in search of a Western education.

More importantly, fundamental Chinese attitudes are changing with respect to the role of trade in a planned economy. Imports are viewed decreasingly as an instrument to serve the needs of the state and increasingly as a means of satisfying the needs of the people. Exports no longer are seen purely as a means of paying for imports, but also as a leading force for upgrading China's domestic industry. By encouraging China's sleepy domestic industries to compete to earn foreign exchange in Western markets, the leadership is attempting to improve the quality of goods produced for the domestic market as well. The Chinese now recognize that in order to maximize the gains from trade they must specialize along lines of comparative advantage—it is no longer enough to export whatever happens to be in surplus domestically. . . .

Despite the rapid increase in trade, China's exports still amount to only a small fraction of domestic output, and a tiny part of world trade. The leadership is genuinely displeased that a nation with nearly one-fifth of the world's population and one-twentieth of the world's economic output, still accounts for less than one percent of the world's trade. They are determined to move China forward into the mainstream. [Davie/Carver, Vol. 2.]

During 1978 a series of contracts valued at $7.8 billion for the supply of equipment and technology for 22 major projects were signed with foreign companies. These activities created great interest among the Western business community in what was conceived as a vast potential of the China market. This period is now characterized in Chinese press articles as *yangyejin*, meaning a leap outward toward foreign countries for the supply of capital and technology, in contrast to the Great Leap Forward relying largely on indigenous, labor-intensive methods some 20 years earlier.

The period of *yangyejin*, however, was relatively short. After a sober assessment of the country's economic situation, Chinese planners came to the realization that there were serious problems in the capital construction sector caused by poor planning, inefficient management, and excessive investment, and that these problems were exacerbated by a further upsurge of investment activity during 1978. As a result, steps were taken in early 1979 to scale down the capital construction program, and many of the 120 major projects were cancelled or postponed. Negotiations with foreign firms slowed down considerably. . . .

Despite China's greater "openness" toward foreign trade and investment, the current retrenchment coupled with various constraints on repayment and absorptive capabilities will limit the immediate and short-term (1–5 year) prospects for any large-scale participation in Chinese capital construction projects by foreign companies. In the next few years, however, significant business opportunities could exist for a number of selective projects. . . .

The long-term (5–10 years) prospect for foreign participation in China's capital construction will hinge on the success that the PRC will have in acquiring foreign capital and technology through various arrangements for the projects in the above four categories in the next few years. That success will greatly facilitate the current readjustment process, and a successful readjustment will almost certainly mean a greatly increased role for foreign capital, equipment, and technology in China's development planning. That success also will increase China's repayment and absorptive capabilities, as well as its confidence and experience in implementing a more open approach. [Chen, Vol. 2.]

High priority probably also will be given to projects that require less hard currency, provide a quicker return on investment, and offer potentially greater export earnings. . . . China's hard currency exports to the West—the PRC's major source of foreign exchange—are expected to slow in 1981–85, largely because of Beijing's efforts to improve living standards, shortfalls in oil production, and growing Western protectionism. Exports of manufactures, especially textiles and other light industry goods, should continue to be the driving force behind China's hard currency export growth.

Under high and low scenarios, projected Chinese hard currency import capacity in 1985 ranges from $44.2 billion to $58.1 billion. Projected 1985 exports, meanwhile, total $41.6 billion to $54.2 billion. As a result, the implied average growth rates for China's hard currency capacity over the next five years are 20 percent and 27 percent while the rates for exports are 19 percent and 25 percent. [Gullo, Vol. 2.]

Japan now stands as China's leading trade partner with about 20 percent of its total exports and imports. The two economies share a natural complementarity buttressed by differences in level of development, wage levels, capital stock, and natural resource endowment. This complementarity provides for large gains to be made from specialization and exchange. Japan's high level of technological development, mechanization, and wage levels combined with a near absence of natural resources contrast sharply with China's lower levels of manufacturing technology, wages, nascent mechanization, as well as abundant reserves of natural resources. . . . [G]eographical proximity, long historical ties, close ethnic identification, the opportunity for mutually advantageous trade, the Chinese-perceived threat from the Soviet Union, and the sheer size of each economy compel closer economic ties between the two countries during the 1980s. These ties have been flourishing under the new institutional framework for Sino-Japanese economic relations developed during the 1970s.

In the China market, Japanese exports often compete directly with those from the United States. Except in iron and steel products, in which Japan holds a major cost advantage and in agricultural goods, in which the United States holds dominant advantage, U.S. and Japanese firms frequently compete head-on for sales to China. . . .

In 1980, for example, while the United States exported $3,754.4 million in merchandise to China, Japan exported $5,108.7 million dollars' worth. [Nanto, Vol. 2.]

China has been a significant importer of grain since the early sixties. In the late seventies, however, China's grain purchases and its importance in world grain markets rose sharply. This surge of imports has had an important impact on U.S. exports of grain, particularly wheat. During 1980 China was the leading export market for U.S. wheat, taking 17 percent of all U.S. exports. Since PRC purchases are concentrated in cheaper grades of wheat, China's impact in this sub-market has been particularly dramatic. During the 1980/81 wheat marketing year which ended in May 1981, sales to China of 6.2 million tons accounted for 73 percent of total U.S. exports of soft red winter wheat. The U.S.–P.R.C. grain trade agreement, signed in October 1980, sets an annual range of 6–9 million tons for U.S. grain sales to China during the 4 year period which began in January 1981. China will therefore continue to be an important market for U.S. grain in years to come. [Surls, Vol. 2.]

Given the size and potential of the Chinese economy, the organization and management of that economy, the nature of a Contracting Party's obligations within GATT, and the complexities of certain methods of PRC entry into GATT, there are likely to be advantages as well as disadvantages for both China and the GATT should the PRC join. . . .

Whether the advantages of the PRC's entry into GATT will outweigh the disadvantages will largely be determined by the mutual desire of the PRC and the GATT Contracting Parties to negotiate a method and terms of accession which will, on the one hand, be acceptable and feasible for China and will ensure, on the other hand, PRC adherence to GATT principles and obligations and effective Chinese reciprocity to GATT members. [Liser, Vol. 2.]

15. *Normalization of commercial relations between the United States and the PRC has been an uneven process. What is the balance sheet? What American legislative and policy barriers restrict further normalization? Extension of trade benefits (MFN tariff status) has had some effects on U.S. imports and employment. How serious have they been? How do Chinese trade practices limit the development of normal trade? Has the development of legal institutions contributed to Chinese modernization and normalization? Have issues such as treatment of industrial and intellectual property and unsettled U.S. claims inhibited trade? How do U.S. firms view their experience in the China trade?*

For over two decades following the Communist takeover of China, commercial relations between the United States and "Mainland China" were virtually nonexistent. During most of that period, the stand-still was principally the result of a comprehensive embargo that the United States imposed on trade with Mainland China after the direct involvement of the Communist Chinese in the Korean War. . . .

The embargo on commercial relations with the PRC was lifted in mid-1971, and by legislative action the PRC's access to some U.S. Commodity Credit Corporation programs was authorized in 1978, a bilateral trade agreement between the United States and the PRC, providing among other things for the reciprocal granting of most-favored-nation status, was approved in 1979, and the PRC's eligibility for the operations of the Overseas Private Investment Corporation was authorized in 1980. Also in 1979, the PRC gained access to Eximbank export credit facilities. . . .

With all this, the U.S. commercial policy toward the PRC and trade relations with it still are not normal in the sense that one would characterize as "normal" the policy toward and relations with the countries of the non-Communist world. Apart from a certain degree of unavoidable functional abnormality that is inherent in trade with a country whose economy is under comprehensive State guidance and control, there still exists a number of U.S. statutory and administrative measures which place on commercial relations with the PRC restrictions that do not apply to the U.S. trade with most of its other trading partners. [Pregelj, Vol. 2.]

Using trade turnover as an indicator, the success of the U.S.-PRC normalization process is quite impressive. Trade turnover stood at $1.1 billion in 1978, it doubled to $2.3 billion in 1979 and doubled again to $4.8 billion in 1980. U.S. exports to the PRC have far outpaced imports, with the Chinese trade deficit growing from $424 million in 1978 to $1.1 billion in 1979 and $2.7 billion in 1980. These large Chinese trade deficits tend to obscure the impressive growth of U.S. imports from the PRC, which expanded from $324 million in 1978, to $592 million in 1979, and to slightly over $1 billion in 1980. . . .

The results suggest that in 1979, U.S. imports from the PRC would have exceeded actual imports by approximately $134 million, or 25 percent had PRC imports been dutied at MFN rates throughout the year. The industries most affected include ceramic products, footwear and textiles and apparel. This translates to a loss of approximately 8600 employment opportunities in the United States. The increased imports in the textile and apparel industry alone would account for approximately 4600 fewer employment opportunities. Had the PRC also enjoyed country-beneficiary status under the U.S. GSP program during 1979, U.S. imports from the PRC would have exceeded actual and MFN imports by 22.2 million, or 4.2 percent. For the ceramic products industry, additional imports of approximately 48 percent of actual 1979 trade would have been generated by GSP. For the furniture and wood products industry the increase would have been 25 percent.

The employment estimates resulting from MFN and GSP status presented in this paper are job opportunities, and are not necessarily changes in actual employment. Normal industry growth, labor force turnover and increased exports to the PRC may offset job opportunity losses in many industries. [Bayard, Ort, Pelzman, Perez-Lopez, Vol. 2.]

China's efforts to organize foreign trade parallel its problems in planning and implementing modernization. The Chinese leadership is still getting organized, a process that will take at least two years and may cover the entire 6th Five Year Plan. In the foreign trade sphere, organization efforts have focused on decentralization, which has long term implications and problems. Foreign trade must succeed if modernization is to work because considerable foreign investment and technology will be drawn from outside China. Current foreign trade policy has the dual purpose of reducing China's foreign exchange shortages and maximizing China's access to world technology. [Monk/Rich, Vol. 2.]

In 1977, when China's leaders dedicated themselves to the four modernizations, they consciously decided to reestablish formal legal institutions as part of their ambitious plan of growth. In light of China's legal history since the Communist victory in 1949, this decision is significant. Since 1949 law had borne the heavy imprint of politics; since the late nineteen-fifties, the Chinese leadership had shown little concern for the fate of formal legal institutions; during the Cultural Revolution, the legal system had virtually disappeared. . . . The most prominent [of the functions served by the new institutions] appear to be (1) reinforcement of discipline and maintenance of social order, (2) control of official arbitrariness, and (3) prospective guidance of organizational and individual behavior, particularly economic. No institution serves only one function, and Chinese legal institutions already serve mutually inconsistent ones. Moreover, in the future some of their functions may change in ways unforeseen or unintended by their creators.

Lastly, some observations have been included on the role of law in China's international economic relations. New laws and regulations have been adopted recently and more are to come. The leadership appears to have the goal of establishing a framework for foreign economic activity in China, including direct investment and a variety of transactions hitherto uncommon or unknown in the China trade. But progress towards creation of a system of clear and consistently-enforced rules to guide foreigners and Chinese officials alike is likely to be very slow. [Luoman, Vol. 2.]

At the present time, Chinese leaders are contemplating significant changes in their treatment of industrial property. New patent and copyright legislation and amendments to China's trademark legislation are in the works. Moreover, interesting reforms foreshadowing these new legal systems have been introduced and are already affecting China's technology transfer activities. [Kirk/Denny, Vol. 2.]

On that cold March morning in 1979, the public waiting room of the Beijing Airport may have seemed an unlikely place for Chinese and American officials to signal agreement on unfreezing the so-called "frozen assets," but the timing came as no surprise. Two months earlier, the United States had finally recognized the People's Republic of China (PRC) as the sole legal government of China. The day before, the U.S. representative, then Treasury Secretary W. Michael Blumenthal, had presided over the official metamorphosis of the U.S. Liaison Office into the first U.S. Embassy in Beijing in 29 years.

In the two years since the settlement was concluded, Sino-American economic relations have indeed progressed. The resolution of the claims/assets problem was by all accounts a prerequisite for that progress, and while the implementation process continues—the last PRC payment is not due until October 1, 1984—the settlement itself is primarily of historical significance. [Lichtenstein, Vol. 2.]

The China market, a place for US companies to buy and sell goods and services, has historically held a promise of fortune. As relative late comers to the market place of "New China," US firms still sense the old promise, but for many initial high hopes have moderated. During the early 1970s, after the 21 year trade embargo was lifted, newly gained access to a quarter of humanity enticed US company executives en masse to draw up plans for capturing just a small percentage of the China market, which appeared vast from the viewpoint of a single company.

At present, there is not a very big pie for so many eager US firms to share. While some American companies have fared well in China, a few very well, most have not. Substantial gains for the majority of US companies in China will be made in the longer term. [Groen, Vol. 2.]

The experience of one U.S. company—Control Data Corporation (CDC) of Minneapolis, Minnesota—will be used to highlight commonality of interest and other key elements of U.S.-Chinese commercial negotiations. Specifically discussed are the CDC negotiations between 1973 and 1978 for the sale of equipment for seismic data processing centers to China.

> The CDC contractual negotiations are important because they represent the sale of significant high-technology items to China and also because by themselves they represent, in dollar terms, a significant share of the total trade turnover for the years in which the transactions occurred.
>
> As of June 1981, however, the U.S. Government still had not granted final approval for the entire transaction. [De Pauw, Vol. 2.]
>
> With political normalization achieved, President Carter and his cabinet recognized the importance of removing existing obstacles and establishing a framework for normal economic interchange. . . . To ensure that bilateral economic problems were quickly addressed, and that within the United States Government economic policy toward China was carefully coordinated, and reflective of U.S. strategic interests, the Carter Administration considered the merits of establishing a joint economic committee with the Chinese. It was envisioned that this committee would differ from joint commissions the United States had with other non-market economy countries, which then focused primarily on trade promotion and business facilitation. While commercial issues were recognized as a critical ingredient in an economic relationship with China, one of the major objectives of U.S. policy makers in the early days of normalization was to set up a forum which would oversee the re-establishment of all aspects of economic ties, such as finance, investment, trade, business facilitation, transportation, agriculture, science and technology, etc. During their January 30, 1979 meeting in Washington, President Carter and Vice Premier Deng Xiaoping discussed the possibility of creating a bilateral forum and agreed to establish a joint economic committee. [Haas, Vol. 2.]

V. IMPLICATIONS OF CHINESE PROBLEMS AND PROSPECTS FOR THE REAGAN ADMINISTRATION AND THE 97TH CONGRESS

Both China's problems, such as uneven economic development, the necessity to retrench, hard currency constraints, and the imbalance in its trade with the United States, and its prospects for economic growth, trade expansion, and attainment of great power status raise a number of policy questions.

CHINA AS A PREFERRED MARKET

In the near term China's limited supply of hard currency will constrain its imports. If the United States decides to facilitate Chinese purchases of industrial and agricultural products with additional government credits from the Export-Import Bank and the Commodity Credit Corporation, a more favorable policy than that applied to many other U.S. trade partners would be required. The immediate prospects for the China market may not warrant a preferential credit policy, but China's longer term economic and political prospects may merit consideration of such a policy.

BEYOND NORMALIZATION

Since the normalization of U.S. trade with China and the liberalization of controls on exports to that country, there has been considerable support for further reductions in trade controls. If this policy is chosen, the United States might consider treating China as a country not subject to the legal constraints of the "Communist country" and "state trading economy" status. Similarly, Chinese industry might be considered "state influenced" instead of "state controlled," in which case the more restrictive market disruption provisions that the U.S. applies to imports from communist countries would not be applicable to Chinese imports. To remove some restrictions, such as the market disruption provisions of Section 406 of the Trade Act of 1974, the mandatory inclusion of safeguard clauses in bilateral agreements, and the ban on imports of Chinese furs, legislation would be required. Other restrictions required by law, notably the ban on Export-Import Bank loans or loan guarantees for communist countries and the Jackson-Vanik Amendment to the Trade Act of 1974, which sets freedom of emigration as a prerequisite for most-favored nation tariff status, are waived for China and several other communist countries. A third category of restrictions, primarily export controls, may be liberalized at the President's discretion.

In moving beyond normalization, the United States should consider whether China's current policies are likely to endure. Because of the chance that the policies of the current Deng leadership could be reversed, any legislative or administrative initiatives should allow the United States flexibility to respond to major changes in policy. It may also be appropriate to consider the potential harm to import-sensitive U.S. industries such as textiles.

LONG-TERM PROSPECTS FOR TRADE AND ECONOMIC COOPERATION

Do the longer term prospects for the China market warrant a preferential policy in the present? If so, the United States might benefit from concluding a long-term economic agreement with China. Depending on whether foreign competitors followed suit, such an agreement could establish an institutional framework that could assure the United States an equal or privileged position in the China market for years to come. In the medium- and long-term joint U.S.-Chinese development projects in metallurgy, transportation, energy or agriculture might be a component of such an agreement. A formal U.S. study of the feasibility of such projects and their likely profitability for the United States might provide some insights on these questions.

ARMS SALES TO TAIWAN AND THE PEOPLE'S REPUBLIC

U.S. arms sales to Taiwan are a stumbling block in the development of closer economic and political relations with the PRC. Chinese displeasure will force the Congress and the Executive to consider the advantages and disadvantages to the United States of continued arms sales to Taiwan. It may also be appropriate to give careful consideration to the desirability of selling arms and dual-use technologies to the People's Republic, even though large Chinese purchases are unlikely in the near term. Military developments, once undertaken, are hard to reverse. Moreover, the United States would have little or no control over Chinese use of military force.

CHINA AS A GLOBAL AND REGIONAL POWER

The mixed pattern of Sino-American relations, in which the two countries' interests converge in some cases, but diverge in others, raises some questions about U.S. policy toward China's economic modernization and normalization of its economic and political relations with the non-communist world.

CHINA AS A POWER

If the United States continues to favor a unified, stable, and strong People's Republic of China what Chinese modernization policies are in our interest? Should we for example, encourage rapid industrial, agricultural and scientific and technological development through our political influence, scientific exchanges, and other means?

CHINA AS AN ACTOR IN THE ASIAN AND GLOBAL ECONOMIES

If Pacific rim economic interrelations develop further toward a Pacific community, should we encourage the PRC to be an active member? In moving toward "normal" economic relations should we refashion our laws and policy away from the restrictions imposed on trade with Communist countries?

WESTERN RECEPTIVITY TOWARD CHINA

If we determine that it is in our interest to play the "China card" as a means of countering the Soviet Union and, at the same time, to foster the modernization of China's economy and the opening of Chinese society to the moderating influences of membership in the community of nations, can we be sure that these goals are compatible? Is there a basis for a U.S. policy toward the PRC that nations with such diverse interests as Japan, South Korea, the ASEAN nations and India may adopt? What formal or informal economic steps might be useful to forge a common policy?

I. POLICY AND PERFORMANCE

THE CHINESE SEARCH FOR THE PATH OF SELF-SUSTAINED GROWTH IN THE 1980's: AN ASSESSMENT

By Robert F. Dernberger*

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SUMMARY

Deng Xiaoping has led the right-wing survivors of the two-line struggle in their steady rise to power within the post-Mao leadership over the years since the death of Mao and the overthrow of the Gang of Four in 1976. This new or post-Mao leadership is dedicated to re-establishing China's economy on the path of sustained growth during the 1980s as a necessary precondition to the long-run achievement of the Four Modernizations. In their search for the path of sustained growth, the post-Mao leadership has introduced a whole series of new economic policies and reforms made necessary by the economic problems, policies, and institutions they inherited from the past. These new economic policies and reforms do not represent a well-defined economic program introduced at a particular point in time. Rather, the post-Mao economic program is the result of a continuous process of experimentation in their search for the path of sustained growth; a process which has encountered problems and undergone several twists and turns, but which is likely to continue throughout the 1980s.

Taken as a whole, the post-Mao leadership's program of economic policies and reforms has become an across-the-board attempt to change the traditional Chinese development model. This involves a rejection of the Maoist radical economic principles in favor of those proposed by the right-wing, the abandonment of Stalin's "big push" develop-

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ment strategy in favor of balanced growth and "consumerism," and a modification of the Soviet-type economic system to incorporate significant elements of market socialism. The particular economic policies and reforms adopted over the past few years are described within this three-fold framework of analysis. While the many problems encountered in and created by the implementation of these policies and reforms are indicated, they also have led to many favorable changes in China's economy that auger well for the attempt to regain self-sustained growth. And while the several short-run economic problems which face the post-Mao leadership have led to a pause and consolidation in some of these new economic policies and reforms, the post-Mao leadership remains dedicated in their search for a new economic development model—principles, strategy, and economic system—more appropriate to China's needs on the road to economic modernization.

One reason for the emphasis given to pointing out the problems encountered in adopting these new economic policies and reforms is to provide a better means for evaluating the probable future course of the new economic program over the course of the 1980s. Although they may well reappear as limiting constraints, the rejection of the Maoist radical economic principles as priority objectives should remain a major ingredient in China's new development model. The current rejection of the Stalinist "big push" in favor of a "balanced growth" strategy is expected to give way during the 1980s to a rate of investment and allocation of investment more representative of a compromise between these two strategies. Finally, the outcome of the current attempt to develop an economic system which represents a mix between a Soviet-type and market socialist system to obtain the central control of the former and economic efficiency of the latter is most difficult to predict. History, logic, and my own subjective impressions lead me to conclude the attempt to change the traditional economic system will fail. Yet, the right-wing of the party has argued for reform of China's Soviet-type economic system since the mid-1950s. The inefficiencies and problems associated with that system have been widely publicized in China over the past few years, and several experiments have been introduced to reform that system to incorporate significant elements of market socialism. Thus, as China searches for the path of self-sustained growth throughout the 1980s, it will do so by means of economic principles and strategies which differ from those in the past, and with an economic system that may incorporate some—perhaps a great many—modifications to allow for the decentralization of decision-making according to market forces, rather than centrally determined plans, in the allocation of resources. This new Chinese economic development model should mark—to a lesser or greater degree—an improvement over the old in the attempt to regain the path of self-sustained growth for China's economy.

BACKGROUND

Economic policies in China today can only be understood as but the latest stage in the continuous evolution of the post-Mao leadership's program to solve the problem of China's economic development. With only two decades remaining for its realization, "the modernization of China's economy by the end of the century" continues to be a largely unfulfilled promise. In the past quarter of a century a high rate of accumulation has been achieved, with the largest share devoted to investment in fixed capital in industry.[1] As a result industrial growth rates have also been impressive, especially those for heavy industry.[2] Thus, whereas in 1952 heavy industry accounted for about one-third of total industrial production, by 1977 it accounted for over one-half. In the 25 years between 1952 and 1977, largely as a result of these high rates of industrial growth, China's national income increased at an average rate of 6.2 percent.[3]

This goal of rapid industrial growth lay behind the Chinese Communist's decision to adopt the Soviet, or centralized-command planning system, in the 1950s. Specific economic policies included the nationalization of the means of production, accumulation of profits as revenue in the state's budget, and direct allocation of that revenue in the form of unilateral grants for investment in industry—especially the producers' goods industries. Inasmuch as China was well endowed with raw material supplies, had surplus labor to supply the increase in industrial employment without creating labor shortages in other sectors, and was at a level of development where extensive rather than intensive investment was required (that is, duplication of basic production facilities as opposed to increasing the capital intensity of existing ones), this economic system worked well to achieve the results depicted in the fore-mentioned macro-economic indicators.

While a high rate of savings and investment and a substantial rate of growth in total industrial production are necessary conditions for achieving economic modernization, historically the record of economic development throughout the world clearly shows that these factors are not sufficient conditions. Economic modernization in today's industrialized countries was achieved through a natural process of evolution stemming from an agricultural revolution which provided the preconditions for their subsequent industrial revolution. In addition, during the industrialization process increases in agricultural productivity kept pace with those in industry. While this is not true of the Soviet Union, a country which also sought modernization through a centralized command planning system, it did begin its industrialization process with a considerable agricultural surplus. By the middle of the twentieth century China's traditional agricultural development had led to a very high level of yields, relative to that of pre-industrial technology. However, the program of industrialization initiated in the early 1950s was launched in an economy which remained dominated by a traditional agricultural sector in which yields per worker were relatively low.[4]

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[1] The average annual rates of accumulation were 24.2 percent in 1953–57, 30.8 percent in 1958–62, 22.7 percent in 1963–65, 26.3 percent in 1966–70, and 33 percent in 1971–75. In "Ups and Downs of Some Major Economic Targets (1953–79)," table in Beijing Review, No. 12 (23 March 1981), p. 25.

[2] Between 1952 and 1977 the gross value of industrial output increased at an annual rate of 9.4 percent, light industry by 8.3 percent, and heavy industry by 12.1 percent. Calculations of compound annual rates of growth are based on statistics presented in "Main Indicators. Development of the National Economy of the People's Republic of China (1949–1979)," State Statistical Bureau of the People's Republic of China, Beijing, 1980. These growth rates are for industrial production in what may be called "current prices" as the source specifically identifies the gross value of output in 1952 as being in 1952 prices and that for 1977 in 1970 prices.

[3] See note 2. The national income statistics in this source are identified as being in "current prices." These and other statistics for China's economic performance used in this paper are merely presented for the purpose of illustrating or supporting the arguments being made. A more detailed and comprehensive analysis of the quantitative dimensions of China's economic performance are to be found in other papers in this volume. See especially; A. G. Ashbrook, "China: Economic Modernization and Long-Term Performance," (for gross national product estimates); John S. Aird, "Recent Demographic Data From China: Problems and Prospects" (for population); John Philip Emerson, "The Labor Force of China, 1957–1980," (for labor force statistics); Robert M. Field, "Growth and Structural Change in Chinese Industry, 1952–1979," (for industrial statistics); Frederic J. Surls and Francis C. Tuan, "China's Agriculture in the Eighties," (for agricultural statistics); Ronald G. Mitchell, "Chinese Defense Spending in the 1980s," (for defense sector estimates); John Davie and Dean Carver, "China's International Trade and Finance," (for foreign sector statistics).

The adoption of the Soviet model was predicated on the accumulation of a large share of national income in the hands of the planners. This involved the extraction of an agricultural surplus by means of agricultural taxes and by assigning quota deliveries of agricultural products to the state at below "market" prices. This provided a source for fixed investment and growth in the industrial sector, with a limited share of investment going to agriculture.[5] Any major developing agricultural country seeking to implement a program of rapid industrialization must "exploit" its agricultural sector to secure the necessary level of investment in industry.[6] In China, however, with the low labor productivity and per capita incomes in the agricultural sector which existed in 1949, the acquisition of the required agricultural surplus for the industrial program necessitated increases in the aggregate level of agricultural production. With the major share of accumulation and investment going to the non-agricultural sectors, these increases in the level of agricultural production relied on the significant increase in the level of inputs within the framework of the traditional agricultural technology.[7] A primary means for providing the required expansion of traditional inputs was the dramatic increase both in the agricultural labor force and in the total number of work days per year.

While the rapid rate of increase in the level of investment in industry resulted in a 7 percent increase in non-agricultural employment per year between 1952 and 1957, these non-agricultural jobs were able to absorb only one-third of the new entrants to the labor force during this period. At the same time, even given the limited new land and capital available, the labor intensive agricultural sector was able to absorb approximately 100 million new agricultural workers.[8] Between

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[4] Although detailed official statistics are not available for 1949, Western estimates indicate that the agricultural labor force still accounted for over 80 percent (81.3 percent to be exact) of the total labor force in 1953, the first year of the First Five Year Plan. Recent reports in the Chinese press refer to agriculture as having contributed 70 percent of the total material output in agriculture and industry in 1949. For an explicit quantitative comparison of the agricultural sectors in Russia and China on the eve of their respective launching of similar economic development programs, see Anthony Tang, "Policy and Performance in Agriculture," in Aleander Eckstein, Walter Galenson, and Ta-chung Liu, eds., "Economic Trends in Communist China" (Chicago: Aldine Publishing Company, 1968). According to Tang's estimates, "when each of the countries entered its respective First Five Year Plan period, in which socialization of agriculture and forced industrialization were to take place, Communist China's per capita food availability in grain terms was less than half that of the Soviet Union." (p. 466).

[5] For an extended analysis of how the Chinese adoption of the Soviet model resulted in the exploitation of the agricultural sector for the purpose of industrialization, see Robert F. Dernberger, "Agriculture in Communist Development Strategy," in Randolph Barker and Radha Sinha, "The Chinese Agricultural Economy" (forthcoming).

[6] Perhaps it is necessary to explain my use of the term "exploited" in this sentence. I use it in the traditional Marxian sense of taking from producers their product without giving them an equivalent value of goods in return.

[7] For a statistical analysis of how the Chinese strategy was to increase agricultural production by means of greater intensity in the use of traditional inputs (without large-scale investments or a technological revolution in this sector), see Anthony M. Tang, "Food and Agriculture in China: Trends and Projections, 1952–77 and 2000," in Anthony M. Tang and Bruce Stone, eds., "Food Production in the People's Republic of China," International Food Policy Research Institute, Research Report 15, May 1980.

[8] See Robert F. Dernberger, "Economical Consequences and Future Implications of Population Growth in China," Paper Series, East-West Population Institute, The East-West Center, University of Hawaii (forthcoming).

1952 and 1977 this more intensive use of traditional inputs (labor) resulted in a 4 percent annual increase in the gross value of agricultural production while grain production increased only by 2.2 percent a year.[9] This positive growth in agricultural production is tempered, however, both by the problems of low labor productivity and per capita incomes existing in 1949 and by the "industry first" priorities of China's leadership. Thus it should come as no surprise that the adoption of these economic policies over the past three decades has resulted in the inheritance by the post-Mao leadership of a serious agricultural problem.

The agricultural growth rates presented above reflect the gross value of output; that is, increases in output obtained by intensifying the use of traditional inputs. In fact, the real cost per unit of output in agriculture has increased; i.e., over the past 25 years total factor productivity has declined—that is, inputs have risen faster than outputs in this sector.[10] One could argue that this exaggerates the evolution of a fundamental agricultural problem faced by the post-Mao leadership. This involves the very rapid increase in the use of inputs purchased from the industrial sector. Inasmuch as agricultural output prices have remained relatively stable while the price of agricultural inputs supplied by the industrial sector has fallen, the money costs per unit of output have not risen fast enough to offset the increase in total output; that is to say, agricultural money incomes have increased. According to surveys carried out by the Chinese, however, the cost of producing grains and cotton increased by more than the value of output between 1965 and 1976. As a result, production costs have exceeded the state's purchase price by 10.6 percent for grain and two percent for cotton by 1976.[11] Quite simply, by relying largely on traditional inputs to achieve agricultural growth and the adoption of a price policy which facilitates the exploitation of agriculture for rapid industrial growth China's policies have made agricultural production less "profitable" in terms of both real resource and money costs.[12]

On the supply side, the crux of the problem inherited by the post-Mao leadership was the necessity of increasing agricultural production. However, their legacy in terms of demand (the distribution of production) was equally problematic. Although the growth of agricultural output was somewhat greater than population growth during this period (1.9 percent), the industrial demand on agricultural surplus grew much faster. As a result, between the mid-1950s and mid-1970s, per capita consumption of foodstuffs did not increase.

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[9] "Main Indicators," based on gross value of agricultural output in 1952, in 1952 prices and in 1977, in 1970 prices.

[10] According to Tang's estimates, total factor productivity in China's agricultural sector in 1977 was 19 percent below the level of 1952 (21 percent below the level of 1957). He states, "Technically, there have been downward shifts in the aggregate agricultural production function in the People's Republic. This suggests the conclusion that the Chinese output growth has been realized at high resource cost, especially when compared with other East Asian nations." In Tang's "Food and Agriculture," op. cit., pp. 27–28. A recent Chinese report confirms that net per capita productivity of the agricultural labor force has not increased since 1957. Ji Ling and Lu Nan, "Discussion of the Sisors Differential Between Agricultural and Industrial Products," Hongqi, No. 6 (1980), p. 48.

[11] The production costs used in these estimates probably included labor costs, valued at the average value for work points. The statistics for estimating the cost of producing grain were obtained from a sample of 2.196 production teams (see Guangming Ribao, 7 December 1978) ; those for cotton from a sample of 302 production brigades (see FBIS, 26 October 1979).

[12] For an excellent detailed illustration of these costs or limits to the achievement of further agricultural growth by means of intensifying the expansion of China's traditional agricultural technology, see Thomas B. Wiens, "The Limits to Agricultural Intensification : The Suzhou Experience," in this volume, which analyzes this attempt to increase the practice of multiple cropping.

> For nearly all of the twenty years from the Second Five-Year Plan period (1958–62) to the downfall of the Gang of Four in 1976 there was little or no rise in living standards. Some years recorded a drop or only a slight rise which, more often than not, reflected rehabilitation rather than real growth. . . . Each peasant's annual grain ration remained for a long time at around 400 *jin* or 200 kilograms of unprocessed grain . . . and the consumption of vegetable oils, eggs and aquatic products, according to our estimates, has not returned to the 1957 level.[13]

Based on various Chinese press reports, I have estimated that between 1955 and 1977 the total per capita disposable income of the peasants increased by 17 yuan (about 10 U.S. dollars). Nicholas Lardy has estimated that the per capita peasant income distributed by the collectives, in constant prices, increased by 7 yuan (about 5 U.S. dollars) between 1957 and 1978.[14] At the same time industrial workers, the sector whose growth was to be the beneficiary of the exploitation of agriculture, fared no better than the peasants.

> The average wages for workers and staff in 1979 were 705 yuan, an increase of 10.6 percent over that of 1957. However prices had risen and real wages showed a decrease.[15]
>
> In the 21 years from 1957 to 1978, the average per capita grain supply in urban areas dropped 3.2 percent; the supply of vegetable oil decreased 33.3 percent; the supply of cotton cloth decreased 2 percent. And this level of supply was maintained only by reducing supply to the countryside and importing grain, edible oils, and cotton.[16]

Despite rationing, various income distribution policies, and the higher priority given the state's supply network in the acquisition of available supply, the rate of increase in the supply of agricultural commodities was not sufficient to meet the state's demand. This growing gap between supply and demand was met by an increased dependence on imports of agricultural commodities. Over the past three decades one of the most significant features of China's economic development performance has been a steady transition away from a traditional position as a net exporter of raw and processed agricultural products, the historical mainstay of China's export trade and a major means of financing a sizable import of the producers' goods essential for the industrialization program. Today, China is dependent on the net import of these same commodities. Based on historical patterns this transition could be interpreted as evidence of the natural results of a country's successful efforts to achieve economic development. In China's case, however, with its large agrarian economy, this transition is the consequence of the failure to solve the agricultural problem.

On the export side, in the 1950s foodstuffs, beverages, and tobacco had accounted for about one-third of China's total exports. By the mid-1970s, this figure was only about one-fourth.[17] The most dramatic change was the decline in exports of soybeans, oilseeds, and their subsidiary products. In the 1950s, the export of these goods accounted for 20 percent of China's exports; in the 1970s only 2 percent. It is on the import side, however, that the growing domestic shortages of agricultural products are reflected most clearly. For example, by the mid-1970s, China had become a net importer of oilseeds and edible vegetable oils and, by the end of the 1970s, one of the world's largest importers of these commodities. Between the 1950s and mid-1970s, China's imports of sugar and cotton increased at an average annual rate of 12 and 20 percent, respectively. By the end of the 1970s, China had become the world's largest importer of raw cotton. The import of sugar accounted for approximately half the total domestic supply, compared to less than one-fifth in the 1950s. Finally, in the 1950s, China was a net exporter of grain, importing virtually no grain at all. After the agricultural crises of 1959–61, imports of grain, mainly wheat, ranged from 4.5 to 6.5 million tons for the next five years. By the end of the 1970s, net imports of grain were running at a level of approximately 10 million tons.

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[13] Liu Guoguang and Wang Xianming, "A Study of the Speed and Balance of China's Economic Development," Social Science in China, No. 4 (1980), p. 19.

[14] My estimate comes from research for a paper yet to be written for publication. An explanation of how this estimate was derived would require more space than is warranted here, but it is important to note that my estimate relies on statistics from sample surveys, national averages, and several simplifying assumptions. The estimate by Lardy is from his article, "Chinese Agriculture Development Policy" (forthcoming).

[15] Liu and Wang, op. cit.

[16] Liang Wensen and Tian Jianghia, "Final Products: A New Point of Departure," Social Sciences in China, No. 4 (1980), p. 61.

[17] For a more detailed analysis of the quantitative changes in the levels of commodity composition of China's foreign trade, see John Davie and Dean Carver, "China's International Trade and Finance," and Fred Surls, "China's Grain Trade," in this volume.

It could be argued that these problems inherited by the post-Mao leadership in the agricultural sector are the "costs" incurred in implementing a development strategy premised on the exploitation of agriculture for the purposes of rapid industrialization. The implementation of the Soviet model did allow (in fact, one could argue it guaranteed) the Chinese to "build 400,000 industrial and transport enterprises with total assets of 800,000 million yuan" (over 500 billion U.S dollars) over the past three decades.[18] This resulted in the 9.4 percent a year increase in industrial production cited above. Thus one could argue that the "costs" of the problems created in the agricultural sector must be weighted against the "benefits" of growth which resulted in the industrial sector. Our major concern in this paper, however, is with the current leadership's new program of economic policies—policies adopted in an attempt to cope with economic problems inherited from the past. Despite the apparent successful record of growth indicated by the macro-indicators for industry, those problems inherited in that sector are as serious as those in agriculture.

In general these problems can be readily summarized as those of growing inefficiencies and inter-industry sectoral imbalances. In a recent article in Renmin Ribao, entitled "Exert efforts to raise the economic results," by He Jianzhang and Zhang Zhouyuan, the Chinese provide us with an excellent illustration of this problem.

> In respect to capital accumulation, for every 100 yuan in accumulation and investments in fixed assets, the amount of national income produced averaged 23 yuan and 34 yuan respectively during the 1976–79 period. These figures are much lower compared with those scored during the first 5-year plan period, which stood at 35 yuan and 52 yuan respectively.
>
> With regard to production, raw material consumption is great. During the period of the first 5-year plan, the proportion of raw material consumption in aggregate social products was estimated to be 44.3 percent. It has continued to grow since the second 5-year plan and reached 56 percent in 1979 . . . Of the 71 targets for raw material consumption in the country's key industrial enterprises in 1979, 48 failed to measure up to the lowest previously attained levels. In 1979 energy consumption for every 100 million yuan worth of gross industrial

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[18] *Beijing Review*, 27 April 1981, p. 6.

> and agricultural output value amounted to 95,000 dun of standard coal, 33,000 dun more than during the period of the first 5-year plan.
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> In respect to the turnover of circulating funds, for every 100 yuan worth of output value turned out by the country's state-run industial enterprises in 1979, a circulating fund of 31 yuan was required on the average. This was 14 yuan more than the lowest level of 17 yuan in 1956.[19]

The article quoted above does not cite comparative statistics for the most direct indicator of changes in efficiency—total factor productivity. For example, we are told that the fixed assets of state-run enterprises increased by approximately 2000 percent between the early 1950s and the end of the 1970s.[20] At the same time staff and workers employed in "units owned by the whole people" is said to have increased by approximately 500 percent.[21] These state-run enterprises are not just those engaged in industrial production, but the industrial sector accounts for by far the largest share of these units. We assume, for our purposes here, that these statistics indicate an average rate of growth of fixed capital and labor in industry of 33 and 6 percent a year between 1952 and 1979.

Inasmuch as the gross value of industrial production increased at an annual rate of 10 percent over the same period, a crude calculation of labor productivity (i.e., dividing the gross value of output by total employment) would show it increased by about 4 percent a year.[22] However, when we take the rapid growth of fixed capital per worker into account in estimating the changes in total factor productivity, using a weight of 75 percent for labor and 25 percent for capital, total factor inputs (labor and capital) increased at an average annual rate of 12.75 percent; i.e., total factor productivity *declined* at an average annual rate of 2.75 percent between the early 1950s and 1979.

A decline in profits per unit of output merely reflects these declines in factor productivity and increases in raw material costs. "Industrial enterprises' average profit from every 100 yuan of output value in the country in 1980 was nearly one-third less than in the record year of 1957." [22a] The cause of these inefficiencies was, to some extent, the disproportionate growth fostered by the priorities pursued in allocating investment among the various sectors. Thus, although heavy industry (especially metals and machine building), had been developed to the point of excess capacity and growing stocks of unwanted output, the energy, building materials, consumers' goods, transportation, and urban social overhead capital sectors (along with agriculture) had emerged as serious constraints on sustained economic growth in China. Speaking about developments in 1976 and 1977 Xue Muqiao, one of China's foremost economists, claimed that "not only was the development of light industry far behind that of heavy industry but also inside heavy industry itself the production of energy and of many kinds of raw materials could not meet the construction needs. Because of the shortage of electric power, many factories had to stop work for 2 to 3 days each week, while many units had to suspend construction to wait for the building materials, and construction of the projects dragged on for a prolonged period of time." [23]

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[19] Renmin Ribao, 30 March 1981, p. 5.

[20] Commentator, "Straighten Out Guidelines for Economic Work—On Leftist Mistakes in Economic Construction," Renmin Ribao, 9 April 1981, p. 5.

[21] Main Indicators, op. cit., p. 8.

[22] The official State Statistical Bureau statistics report an average annual increase in labor productivity of 3.9 percent a year in "industrial enterprises owned by the whole people" between 1952 and 1979. Main Indicators, op. cit., p. 9.

[22a] Commentator, "Increase Economic Results and Broaden the Sources of Revenue," FBIS, 17 March 1981, L 17.

This somewhat lengthly introduction has been presented to indicate the magnitude of the serious economic problems faced by the post-Mao leadership when they regained power after the death of Mao. The economic policies they have adopted and implemented over the past few years represent an evolutionary process of their attempts to solve these problems. A critical analysis of the consequences and success or failure of these economic policies must take into account the fact that these complex economic issues were a legacy of China's economic development strategy to which the current leadership found themselves heir.

P.R.C. Industrial Policies, 1978 to the Present: An Overview

The death of Mao and overthrow of the Gang of Four in the fall of 1976 was followed by the rehabilitation and reascendance to power of leading elements of the right-wing under Hua Guofeng's transition government in 1977. At that time the post-Mao leadership saw their economic problems as easily solved by the mere overthrow of the Gang of Four and the elimination of the counterproductive effects of their policies on China's modernization. Thus when the First Session of the Fifth National Peoples' Congress was held in the spring of 1978 Hua Guofeng's "Report on the Work of the Government" focused on the outline of the Ten Year Plan (1975–85) for China's modernization.[24] Mao's principle of continuing revolution to achieve the advanced stages of socialism and the Maoist edict of "politics in command" were to give way to a stress on solving China's problems of economic development.

The basic framework of the Ten Year Plan adhered to the same priorities of rapid accumulation and investment that had been pursued in the past. Investment in industry over the next seven years was to be greater than that of the entire past 28 years. One hundred twenty major projects were to be constructed and industrial output was to increase by over ten percent a year. These policies were to yield a gross value of output over the next seven years greater than that of the entire past 28 years. Within the industrial sector it was heavy industry, especially those traditional priorities of the Soviet-style planners, that would be favored.

Despite this renewed emphasis on the traditional pattern of high rates of accumulation for the construction of new industrial production facilities—especially in heavy industry—agricultural production was expected to expand rapidly as well. Over the eight years between 1978 and 1985, the gross value of agricultural production was planned to increase by 4.5 percent a year, with grain production increasing by more than 4.4 percent a year. Apparently these optimistic projections for agricultural growth were related to the post-Mao leadership's belief that the radical policies of the Gang of Four were responsible for most of China's economic woes.

> In the 11 years from 1966 to 1976, despite serious interference and sabotage by the . . . Gang of Four, grain output still registered an annual increase of over

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[23] Xue Muqiao, "Adjust the National Economy and Promote Overall Balance," Jingji Yanjiu, No. 2 (20 February 1981), p. 27.

[24] Beijing Review, No. 10 (30 March 1978).

> 4.3 percent in a third of the provinces, municipalities, and autonomous regions, with a maximum of 5.5 percent. . . . With the smashing of the Gang of Four, we believe that it is entirely possible for all the provinces, municipalities, and autonomous regions to attain or exceed this rate of increase through their (own) efforts.[25]

Soon after the introduction of the Ten Year Plan, however, the Chinese became aware that China's economic problems were not simply a matter of radical policies and interference.

Although the production of grain and cotton failed to meet the planned target for 1978, output did grow by 7.8 and 5.8 percent, respectively.[26] Furthermore, the very rapid growth of commercial crop production (oil-bearing crops, 30 percent increase; sugar cane, 18.9 percent increase; and jute, 26.4 percent increase) meant that recovery in the agricultural sector, begun in the previous year, continued. Thus in 1978 the gross value of agriculture showed an increase of 8.9 percent, 2.7 percent above the planned target. Growth in the gross value of industrial production was also impressive; 14.3 and 13.5 percent in 1977 and 1978, respectively. Nonetheless, serious economic bottlenecks which impeded the continued revival and sustained growth of the economy became more and more obvious. Looking back on this period Xue Muqiao claims that:

> At this juncture, these imbalances in the internal relationships of our national economy (were) becoming very serious. This imbalance had been in existence over the past 20 years, since 1958. . . . For this reason, the "leftist errors which had existed for 20 years in economic work could not be swiftly corrected and, instead, in 1978, the errors of the "Great Leap Forward" were once again committed. In the state budget, the appropriations for capital construction increased by 50 percent and the accumulation rate reached 36.5 percent. . . . (Over the 1970s) the scale of capital construction expanded continuously and was achieved principally by lowering the consumption level of the populace. In 1976 and 1977, the average grain ration per peasant was smaller than that in 1956 and 1957, the average wage of the workers and employees was also lower, while the supply of subsidiary food products in the cities became increasingly stringent. . . . Some comrades who had been engaged in economic work for a long time commented: "Accumulation provides the only source for expanding reproduction;" lowering the accumulation rate would lower the speed of development of production and in turn it would not be possible to improve the people's living standard. . . . The problem was that the plan not only did not leave any leeway but actually had many gaps. In reality, over several recent years the supply of such items as steel products, coal, electricity, cement, timber and transport could not meet demand. . . . The insufficiency of materials for construction caused a squeeze on production, while insufficient supplies for heavy industrial production caused a squeeze on light industry and all joined together to cause a squeeze on agriculture.
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> The growth in industrial production in 1977 and 1978 not only was of the nature of a recovery (there was no industrial growth in 1976) but it also comprised certain false elements. Many of the plants, anxious to fulfill their production plans, allowed the production costs to rise, and in particular they turned out many kinds of products not needed in the market or by the consumers and these had to be stockpiled in the warehouses. Production of machinery and iron and steel claimed to have the highest speed but the stockpiling of products of these two categories was the highest and most serious. What kind of economic result was actually achieved from this high production speed?[27]

Recognizing and reacting to the serious economic problems associated with their traditional economic development strategy, in December of 1978 the Third Plenary Session of the Eleventh Central Committee adopted several draft proposals for correcting this "sad state of imbalance." These were circulated and discussed internally.

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[25] Hua Guofeng, "Report on the Work of the Government," Beijing Review, No. 10 (30 March 1978), p. 20.

[26] The statistics for output growth in 1978 used in this paragraph are from Main Indicators, op. cit.; those for 1977 are from Xue Muqiao, op. cit.

[27] Xue Muqiao, op. cit.

In his "Report on the Work of the Government" at the Second Session of the Fifth National People's Congress (held in June 1979), Hua announced that the study of the Third Plenum's proposals had led to the conclusion that "on the basis of the solid achievement in economic recovery and growth during the past two years and more, the country should devote the three years beginning from 1979 to readjusting, restructuring, consolidating, and improving the national economy in order to bring it, step by step on to the path of sustained, proportionate and high speed development." [28] In other words, the Ten Year Plan was put on the shelf. The State Planning Commission "revised the plan worked out for developing the national economy in 1979," and the post-Mao leadership sought self-sustained growth by means of a new and sweeping program of economic policies. These were packaged under the labels of readjusting, restructuring, consolidating, and improving—the "eight character program" of economic reform.

Readjusting referred to the necessary changes in priorities for the allocation of investment and inputs aimed at correcting the serious imbalances in the economy. New policies would give greater priority to those sectors which had emerged as critical bottlenecks to China's balanced growth. Important in this area were energy, consumers' goods, transportation, agriculture, social overhead capital (education and housing), and building materials. Restructuring dealt with the economic reform of the economic system itself, aimed at achieving greater efficiency. This involved giving greater decision-making power to local units of production and in increasing the role played by market forces. Reforms involved in consolidation referred to the weeding out or amalgamation of those enterprises that were not only suffering losses, but—more important—were wasting real resources. Improving focused on attempts to elevate the level of technology and managerial skills and practices in China's economy. This aimed at not merely borrowing modern technology, knowledge, and managerial techniques from abroad to close the ever-widening gap between China and the advanced or developed countries, but also at closing the considerable gap between the average level of technology and management within a particular sector as a whole and that of the leading or advanced units in that sector.

The particular details of the current leadership's "eight character" program of economic reform will be presented in a later section of this paper. We can state at this point, however, that the adoption and implementation of various new economic policies, many on an experimental basis, increased steadily throughout the remainder of 1979 and 1980. Collectively they involved a sweeping package of economic reform which could be legitimately called China's version of a New Economic Program.[29]

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[28] Hua Guofeng, "Report on the Work of the Government," FBIS, 2 July 1979, supplement.

[29] Unlike the New Economic Program in the Soviet Union in the early 1920s, it will be argued in this paper that the Chinese economic reforms of the past few years have not discarded the basic economic system of the previous period; i.e., the system of central, nonmarket, planned allocation of resources has not been replaced, only supplemented, by the post-Mao economic reforms.

In 1979 the macro-economic indicators for economic performance showed that recovery and growth in both output and money incomes continued at impressive levels.[30] The gross value of agricultural production increased by 8.6 percent, largely due to the very rapid growth in the output of grain (9 percent) and oil-bearing crops (23.3 percent).[31] In fact, agricultural growth was slightly greater than the growth in the gross value of industrial production (8.5 percent). This was due largely to the decline in the growth of heavy industrial production (7.7 percent as compared to 15.6 percent in 1978) and partially to the introduction of the readjustment program in 1979. Yet despite these impressive growth rates in the macro-economic indices, economic problems continued to plague the new leadership.

In agriculture, although the gross value of output increased by 8.6 percent and grain output went up by 9 percent, due to the increase in money incomes of both peasants and workers in 1970 the consumption fund increased by 16.5 percent.[32] In addition, while light industrial production had increased by 9.6 percent, growth in the production of many agricultural commodities important as inputs in light industry failed to meet the plan target. These included: cotton (1.8 percent growth in 1979), sugar cane (1.9 percent), jute (0.1 percent), and tea (3.4 percent). Thus in order to close the growing gap between domestic supply and demand, the import of agricultural products was increased. Grain imports increased by over 1.5 million tons, to a peak level of 11 million tons in 1979, imports of soybeans almost tripled (to a level of over half a million tons), and—despite higher prices—cotton imports increased to account for over one-fourth of the total domestic supply.[33]

Import demands for producers' goods generated by the original Ten Year Plan itself were tremendous. The Chinese quickly became involved in negotiating for a large number of plants and for the foreign loans necessary to finance them. By the end of 1978 the foreign debt implications of these negotiations were becoming clearer; in that year the import surplus in the balance of commodity trade stood at slightly more than 1 billion U.S. dollars. As the Chinese began to have second thoughts about their Ten Year Plan a pause occurred in these negotiations. Yet while these doubts led to a revision in the plan for 1979 and the introduction of the "eight character" program, the rapid pace of complete plant imports and foreign loan negotiations were resumed. As a result China's import surplus increased to almost 2 billion U.S. dollars in that year.[34]

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[30] The advocates of economic policy reform in China argue this is one of the problems they face in gaining support for the policy changes. During a similar period of economic policy reform in the early 1960s, because the economic indicators clearly revealed the need for reform, the reforms were readily accepted by almost everyone. In 1977–79, however, these same indicators showed rather high rates of growth and many challenged the need for economic reform. In Xue Muqiao's article cited above, he tells us that the internal discussion of the draft reform proposals issued by the Third Plenum at the end of 1978 led to "a bitter debate" within the party and the government.

[31] Statistics for output growth in 1979 in this paragraph are from Main Indicators, op. cit.

[32] The increase in consumption fund for 1979 was estimated by multiplying national income times one minus the "percentage of accumulation in national income" in both 1978 and 1979. National income data from Main Indicators, op. cit.; rate of accumulation from "Ups and Downs of Some Major Economic Targets," op. cit.

[33] Trade data for 1979 is from National Foreign Assessment Center, "China: International Trade. Second Quarter, 1980." ER CIT 81–001, February, 1981.

[34] Balance of trade statistics from 1978 and 1979 are from Main Indicators, op. cit., pp. 7–8.

Shortly after the overthrow of the Gang of Four many of those youths previously sent down to the countryside were able to rejoin their families in the urban areas. In addition, although the universities were reopened, they were able only to absorb a miniscule share of the graduates from high schools. Furthermore, as a result of the "eight character" program, new job opportunities in urban areas were limited. In response to this problem the government urged these youths to form collectives or to engage in private enterprise in the service trades which were badly needed in the cities. Similarly they could "volunteer" to return to the countryside, especially to the frontier areas. Despite claims that jobs were found for many of these people, estimates place the number of urban unemployed at more than 20 million, or approximately the same amount of unemployment created in the early 1960s during a similar period of economic rehabilitation.[35]

A budget deficit of over 10 billion U.S. dollars led to a substantial increase in the money supply and serious inflationary pressures. While the planned budget for 1979 was balanced, attempts to increase peasant and worker incomes resulted in revenues falling 4.6 percent short of planned expenditures. This shortfall was compounded by the fact that planned expenditures rose 7.4 percent above the budgeted figures.[36] The inflationary pressures generated by this total budget deficit ultimately led to actual price increases, both official and illegal, in 1980. While the "official" rate of inflation that year is said to have been 6 percent (13.8 percent for foodstuffs), most observers believe it was well above 10 percent.

By the time of the Third Session of the Fifth National People's Congress held in September 1980, Hua Guofeng in his "Report on the Work of the Government" claimed that "our economy has taken on a fairly new look in the past year or so as a result of the process of readjustment, restructuring, consolidation, and improvement. . . . Practice has proved that the ("eight character") policy . . . is correct and has revitalized our economy and led it on to the path of sound development."[37] Other speakers at the Congress, however, had the unenviable task of reporting that the economic policies and reforms adopted by the post-Mao leadership had led to budget deficits, inflation, import surpluses, declining growth rates, large pockets of poverty in the rural areas, and urban unemployment.[38] It was admitted that the goal of putting the economy back on the track of self-sustained economic growth in three years would require an additional two years. A one-year plan for 1981 was announced, along with plans for the formulation of a new five-year plan for the period 1981–85. Within a few months, following the Third Session of the Fifth National People's Congress, it was learned that even the earlier estimates for 1980 were not realized.

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[35] According to a survey of 87,000 wage and salary earner families in 44 cities in 1980, unemployment is an important explanation of urban poverty. In families in the "very poor" class (below 15 yuan a month of disposable income per capita), those who have a job earn a wage and salary that is 97.7 percent of the average wage or salary for all wage and salary earners, but one worker in every 2.5 families in the "very poor" class is unemployed. NCNC, 30 December 1980.

[36] Wang Bingqian, "Report on Financial Work," Beijing Review, No. 39 (29 September 1980), pp. 11–12.

[37] "Hua Guofeng's Speech" (full text), Beijing Review, No. 38 (22 September 1980), pp. 13–14).

[38] For example, see Yao Yilin, "Report on the Arrangements for the National Economic Plans for 1980 and 1981," Beijing Review, No. 38 (22 September 1980).

With the exception of grain, output targets for "all seven other major agricultural products" were overfulfilled in 1980. Cotton production increased by 22.7 percent and oil-bearing crops by 19.5 percent.[39] The 4.2 percent shortfall in grain production was due both to serious natural calamities (especially in North China) and the shift of both land and labor efforts to more profitable crops. On balance, the gross value of agricultural production increased by only 2.7 percent, although this was said to be 3.3 percent above the revised plan released in September 1980. That same year heavy industrial production had increased by only 1.4 percent. However, because the target for light industry was exceeded by almost ten percentage points (increasing by 18.4 percent), there was an overfulfillment of the targeted increase for industrial production as a whole. The slow growth in heavy industrial production was a major problem because it included an absolute decline in some critically needed commodities; for example, energy. The planned budget deficit for 1980 was exceeded by 50 percent, leading to further overdrafts from the bank and an increase in currency circulation of 7.6 billion yuan (more than double the planned amount). Significantly aided by a rise in petroleum prices, exports increased more rapidly than imports. As a result, the import surplus decreased to 570 million U.S. dollars, compared to 1.87 billion in the previous year.

The impact of all these factors is reflected in the adoption of a revised plan and budget for 1981 at the Seventeenth Meeting of the Standing Committee of the Fifth National Peoples' Congress. These measures reduced the projected budget revenues and expenditures by 9.1 and 13.2 percent, respectively, to provide a balanced budget. The large reduction in planned expenditures was to be achieved by a 45 percent reduction in the planned capital construction target for 1981 and additional restrictions in planned expenditures for national defense and government administration. Although few details of the readjusted economic plan have been announced, the extent of the energy crisis as a serious bottleneck is indicated by no growth in 1979, a decrease in output in 1980, and the further reduction in the energy output targets for 1981 (a 6 million ton reduction in the original target for oil; 21 million tons for coal). In addition the steel production target was reduced by 5.7 percent to save on energy consumption and transport needs. According to Xue Muqiao "this year (1981), another big readjustment is being attempted and the industrial growth rate is estimated to be only 3 to 5 percent."[40]

The Chinese now admit they had lost complete control over capital construction, as well as budget expenditures, imports, prices, and wage and bonus payments.[41] They have also been forced to admit that "the planned goal of modernization in the next 20 years will be at a moderate level and not up to the present level of economically advanced countries. . . . a long and strenuous process is required to make the country and the people prosperous."[42]

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[39] Unless otherwise noted, the economic statistics in this and the next paragraph are from "Communique on Fulfillment of China's 1980 National Economic Plan," Beijing Review, No. 19 (11 May 1981) and Yao Yilin, "Report on the Readjustment of the 1981 National Economic Plan and State Revenue and Expenditures" (excerpts), Beijing Review, No. 11 (16 March 1981).

[40] Xue Muqiao, op. cit.

[41] For example, "at present, we not only have no control over the number of workers, but we have also lost control over wages as a result of the indiscriminate handing out of bonuses by some of the enterprises." Commentator, "How to Appraise the Current Economic Situation," Honqi, No 6 (March 1981).

At the present time it has been decided that further experimentation with reform of the economic system should not be extended and that a "consolidation" of experiences in these reforms is necessary before moving further. Quite simply, the Chinese have concluded that the readjustment of the economy and public finance; i.e., the restoration of equilibrium in supply and demand, must be achieved before further reform of the economic system is carried out. Thus, "in carrying out the eight-character policy . . . readjustment is the key (and) in order to get rather quick results from readjustments, it is necessary to guarantee that the principal regulatory forces under this system—administrative orders and directive plans—possess full authority, and that they are properly centralized and unified."[43] An eight point list detailing specific areas of policy change, published in *Beijing Review* on 16 March 1981, outlines ways in which the central government is reasserting its traditional power of central control and unified authority. These are: (1) the plan; (2) funds for investment; (3) financial and taxation systems; (4) credit and cash systems; (5) material supply and allocation systems; (6) prices; (7) wages, bonuses, and fringe benefits; and, (8) foreign trade and foreign exchange. This extensive list (and one might ask if anything was excluded) would seem to represent a major setback for the economic reform policies, especially in the industrial sector.

The preceding overview of the chronological evolution of the current leadership's economic policies has been presented to provide the necessary framework for the discussion that follows. We will ask: What were the specific policies? What were they attempting to do? With what results? What are their prospects for the future? As the discussion above makes clear, over the past three or four years a wide variety, not a single comprehensive and well integrated package, of economic policies was adopted. Yet I believe one can interpret the post-Mao leadership's economic policies as consistent in an attempt to considerably modify the total economic development model—economic system and strategy—they had inherited in the mid-1970s.

THE INHERITED ECONOMIC DEVELOPMENT MODEL[44]

The economic development model inherited by the current leadership in the late 1970s consisted of three major ingredients: a Soviet model (the centralized-planned economic system); the Stalinist development strategy (the "big push"); and Maoist ideology (the radical principles). The first two ingredients were adopted by the Chinese in the mid-1950s and continued to be major features of China's development strategy until the time of Mao's death. Maoist ideology became operational as part of the Chinese development strategy briefly during the Great Leap Forward in 1958–59, reemerging during the Cultural

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[42] "Straighten Out the Guidelines in Economic Work," Renmin Ribao, FBIS (10 April 1981), K 13.

[43] Wu Jingliap and Zhou Shulian, "Correctly Handle the Relationship Between Readjustment and Restructuring," Renmin Ribao (5 December 1980), p. 5.

[44] Some readers will argue the discussion in this section of the paper is a simplification of a very complex situation with tremendous variation over time. My response is: true, but all meaningful analysis is based on a simplification of reality. The real test is if the abstraction of reality allows for meaningful analyses and conclusions or, because of too great a level of abstraction, the analyses and conclusions are not only meaningless, but wrong. In this case I must leave it to the reader to decide.

Revolution in the late 1960s through the time of Mao's death. I believe that the combination of these three major ingredients best represents what most people have in mind when they refer to the Chinese model; certainly they made up the development model inherited by the post-Mao leadership in the late 1970s.

The basic ingredient in China's economic paradigm is the Soviet model, or the economic system itself. Often referred to as the centralized-planning or command model, I have called it the Soviet model because it was first adopted and implemented in the Soviet Union and the Chinese directly borrowed it from that country. In the industrial sector the means of production are nationalized and run by public managers who are assigned production targets by the state. These and other targets are determined by a bureaucratic planning administration. In agriculture, production is collectivized and the collectives are assigned plans for cropping, yield, and delivery quota sales to the state. Trade; that is, purchase and distribution of key commodities including all producers' goods and most major agricultural products and all foreign trade, is monopolized by the state's trading agencies under a unified supply plan. Public finance is also unified in the state's budget, with the profits of state enterprises being collected as budget revenue and allocated as unilateral grants for investment projects or as subsidies to cover losses incurred by state enterprises. Prices are set by the state and workers are hired by the state's labor bureaus and assigned to factories where they are paid wages set by the state.[45]

The adoption of this economic system, of course, places tremendous control over the mobilization and allocation of resources in the hands of the central planners. There is no reason, in theory at least, why the central planners cannot use this power to favor agricultural development, increases in the standard of living, light industrial production, investment in urban social overhead capital, or any other sector they choose. Historically, however, countries which have adopted the Soviet model have also adopted the priorities set by Stalin and his central planners. These priorities place heavy emphasis on a very high rate of investment and rapid growth in heavy industrial production, especially the basic metals and machine building industries. This occurs at the expense of agricultural development, increases in light industry and the standard of living, or the development of the service sectors. In fact, these priorities are so typical a feature of economic planning in countries that have adopted the Soviet model; i.e., the economic system, that many authors include them as an important ingredient of that model. Arguments and empirical evidence presented in the Chinese press over the past two years make it clear that China had also implemented the Stalinist model throughout the quarter of a century before the death of Mao.

It is the third element which makes the Chinese model unique; the Maoist ideology. Unlike the basic features of the Soviet and Stalinist models, the extent to which Maoist radical principles were a dominant factor in influencing economic decision-making and activity varied considerably between regions and over time. When the right-wing emerged victorious after the death of Mao and overthrow of the Gang of Four at the end of 1976, however, the Maoist model was an integral part of the development model they inherited from the past. Radical Maoist economic principles included: (a) local, regional, and national self-sufficiency, with limited dependence on foreign trade or assistance; i.e., the reduction of specialization in the division of labor; (b) egalitarianism and normative incentives, including mass campaigns, and a reduction in relating individual, small group, or unit income to the quality and quantity of work accomplished; (c) the elimination of the "vestiges" of capitalism or the reduction and elimination of private income earning activities outside the socialist sector; (d) mass participation in decision-making or the elimination of an explicit hierarchy of authority and responsibility based on skills or expertise and job assignment; and, (e) the politicization of economic decision-making, behavorial rules, and policy determination and reduced emphasis on economic rationality, in the sense of economic cost and benefit calculations.

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[45] For an excellent argument of why China's economic system in the mid-1970s represents the traditional Soviet model, despite several modifications the Chinese have tried to introduce in that model over the past two decades, see Benjamin Ward, "The Chinese Approach to Economic Development," in Robert F. Dernberger, ed., "China's Development Experience in Comparative Perspective" (Cambridge: Harvard University Press, 1980), pp. 93–95.

Any description of China's development model and strategy in the mid-1970s would have to include a combination of the Soviet model, Stalinist strategy, and Maoist ideology, as defined above. The evolution of the post-Mao leadership's package of economic policies, I believe, represents an attempt to reform each of these three components inherited from the past. Moreover, the evolution of their package of economic reforms over the past few years reveals a sequential pattern which provides an important explanation of what these economic reforms policies are trying to achieve, where and why they have encountered problems, and their prospects in the future.

THE POST-MAO LEADERSHIP'S PROGRAM OF ECONOMIC POLICIES: REFORM OF THE MAOIST IDEOLOGY

The post-Mao leadership, which included many veteran right-wing casualties of the two line struggle of the previous two decades, began to discard the Maoist model almost immediately upon regaining positions of authority. They initially believed this alone would be sufficient for putting China's economy back on the path of self-sustained economic growth, the economy having been diverted from that path due to the influence of radical economic policies during the previous decade. The Maoist model was judged to be an intuitive and corruptive interpretation of true Marxism. The right-wing leadership now sought the "economic principles of socialism during the transition period from capitalism to communism" from the basic texts—Marx, Engels, Lenin, Stalin, and even Mao himself. Such theories were to be combined with empirical evidence; i.e., seeking truth from practice.[46]

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[46] Deng Xiaoping's attempt to eliminate the continued influence of the Maoist economic principles advocated by the left-wing of the party by arguing that "practice is the sole criterion for testing truth" encountered significant opposition in 1978. A major article in Deng's effort was "Practice is the Sole Criterion for Testing Truth," which first appeared on 11 May 1978 and was publicly endorsed by Deng in an important speech on June 2nd. Deng's opposition were those labeled the "whateverists;" a term derived from an argument presented in the party journal *Hongqi*. This article had stated "whatever the decision made by Chairman Mao was, we will resolutely support; whatever Chairman Mao's directive was, we will unswervingly obey." *Hongqi*, No. 3 (1977), p. 10). According to a history of party released by the Sixth Plenary Session of the Eleventh Central Committee (June 1981), Hua Guofeng was a member of the "whateverist" group and opposed Deng's policy of seeking truth from practice. See "On Questions of Party History," Beijing Review, No. 27 (6 July 1981), p. 26.

Mao's principle of a continuing revolution promoted by class struggle, anti-rightist and socialist education campaigns, was to be indefinitely postponed as a primary objective, while economic development became China's immediate and major objective. In his "Report on the Work of the Government" to the First Session of the Fifth National Peoples' Congress in the spring of 1978 Hua emphasized this change in objectives. He stated, "In order to make China a modern, powerful socialist country by the end of the century, we must work and fight hard in the political, economic, cultural, military and diplomatic spheres, but in the final analysis what is of importance is the rapid development of our socialist economy."[47] As for the Marxist justification for economics rather than politics being in command during the period of transition, this is testified to in Deng Xiaoping's eulogy at the memorial service for Zang Wentian on August 25, 1979 and by a *Renmin Ribao* article published that same day.[48] This article was one which Zang had written in 1973, but had never been allowed to publish. In that piece Zang argued:

> In the long run of history, an important political line will be tried and eventually condemned by economic laws instead of changing the inevitable trend predicted by economic laws. The struggle between a correct and incorrect political line always explicitly or implicitly and directly or indirectly reflects the contradictions between economics and politics. A correct political line will eventually win out because it adapts itself to economics . . . as for those "politicians" who talk volubly about politics and fear to deal with economics, they should please carefully study what is the true content of "politics being the concentrated expression of economics."(phrase quoted from the works of Lenin).

In other words, instead of politics being in command, economics *was* politics and those cadres who had been recruited over the past two decades on the basis of their "redness" were to either become experts or be replaced by those who were.

The Third Plenum of the Eleventh Central Committee held in December 1978, which acknowledged the importance of relying on practice as the sole criterion for testing truth, has been called "a turning point in Chinese political development since the May 4th (1919) period."[49] In economic terms this plenum marks the launching of the process in which the "true" economic laws or principles of socialism (those advocated by the right-wing of the party) have replaced Maoist principles as the party's official economic policy. In addition, a great many of those judged to have been falsely accused and persecuted during the Cultural Revolution have now been exonerated and rehabilitated. These reprieves have even been posthumously extended to those "persecuted to death." Finally, many who have suffered from discrimination and struggles due to their class labels as landlord and capitalist which they inherited from their origins before 1949 have been reclassified on the basis of their present occupations. Those who have benefitted from rehabilitation or reclassification undoubtedly offer strong support for the new leadership and their package of economic reforms.

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[47] Hua Guofeng, "Unite and Strive to Build a Modern, Powerful Socialist Country!" Beijing Review, No. 10 (30 March 1978), p. 18.

[48] Zang was a veteran communist party member for more than 50 years and had died but a month before the overthrow of the Gang of Four.

[49] See Tang Tsou, Marc Blecher and Mitch Meisner, "Policy Change at the National Summit and Institutional Transformation at the Local Level: The Case of Tachai and Hsiyang County in the Post-Mao Era," Selected Papers from the Center for Far Eastern Studies (University of Chicago), No. 4 (1979-80), p. 282. According to the Chinese communists, the Third Plenum "marked a crucial turning point of far-reaching significance in the history of our Party since the birth of the People's Republic." See "On Questions of Party History," op. cit., p. 26.

Nonetheless, this abrupt switch in lines, made possible by the death of Mao and the overthrow of radical Maoists at the top level of leadership, has resulted in the creation of serious obstacles to the implementation of the new leadership's package of economic reforms. For instance, although there have been suggestions that a purge of the lower ranks of the party will be carried out in the future, the bulk of cadre at the local levels—where the economic policies are implemented—continue to include not only Maoists, but those who implemented, administered, and believe in the Soviet and Stalinist elements of the Chinese development model. It is they and not a new cohort of party cadre who are being asked to implement a whole new package of economic policies; and one which will, in fact, considerably modify economic administration as they have practiced it in the past.[50] Given these problems it is little wonder that resistance to the implementation of new economic reforms is being blamed, extensively in the Chinese press, on the remnants of "feudal" ideas and behavior that continue to characterize China's political, economic, and social system.

The principle of self-sufficiency is one of the most basic Maoist principles to be rejected by the new leadership. Instead they favor greater specialization and reliance on comparative advantage in the division of labor—within the unit of production, as well as regionally and internationally. In agriculture Maoist policies centered on taking grain as the key link, increasing self sufficiency in grain production (even within individual communes), and limiting intra-provincial grain transfers and specialization in commercial farming. Over the previous two decades these policies had proved to be a source of tremendous inefficiency.[51] For example, areas best suited to animal husbandry were forced to convert grazing land into wheat fields; high yield commercial or industrial crop areas were forced to devote a portion of their cropping areas to lower-yield production of grain. Once in power, however, the right wing had no difficulty in arguing that socialism does not deny the benefits of the division of labor, specialization, and the gains from trade. Nor did they hesitate to cite examples ("practice") to show the benefits to be obtained from specialization in agriculture. Now individual agricultural units were to produce on the basis of their particular resource endowments and advantages, aimed at the all-round development of China's agriculture, including animal husbandry, forestry, commercial and industrial crops, and sericulture. Such a policy sought to correct the neglect of non-grain agricultural activities that had resulted from the emphasis and key priority given grain production in the past.

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[50] One is reminded of a similar occasion in Chinese history; i.e., the Hundred Days Reform at the end of the nineteenth century, when the Confucian officials were being asked to implement a reform program that would change the system which had justified their past behavior and even their existence.

[51] Obviously, as is true of traditional agriculture in most countries, the typical peasant or team desired to grow products to meet some of their own needs, to avoid risks, and assure a minimum standard of living. This was also important to the Chinese peasant where a free grain market did not exist and external supplies of grain depended on the bureaucratically administered state supply network. Thus the peasants' standard of living was largely determined by their share of the collectives' output of grain, which was distributed as income in kind to its members. It is therefore highly unlikely that even given a choice the Chinese peasant would choose to completely specialize in the production of non-grain crops or in non-crop farm sector activities. On the other hand, the emphasis given self-sufficient grain production at the local level throughout China (enforced by the state's assignment of cropping plans, quotas for deliveries to the state, and the state's control over the grain distribution and trade network) obviously increased the local allocation of land and labor for growing grain at the expense of more "profitable" and desirable agricultural activities. Such a policy often led to serious inefficiencies in the allocation of resources. In fact, because many production teams were unable to meet their yield targets for grain, they were forced to devote even more land—unreported—for growing grain than was called for in their assigned cropping plan. In this way they hoped to meet their grain delivery quotas and yield targets—reported yields being determined by dividing actual output by "planned" cropping area.

The post-Mao leadership's recognition of the inefficiencies associated with the policies of self-sufficiency in grain production at the local level was central to their decision to promote specialization and diversification. Not only was it a rational policy change, it was obviously welcomed by those at the local levels. Rational as it may be in theory, however, the attempt to implement this policy has uncovered many practical problems which both limit its implementation and impede the realization of the gains from specialization and trade that it attempts to promote. Despite the priority given grain production over the previous two decades, per capita grain availability was relatively low, not only as a national average, but especially in many communes throughout China, and a significant share of the grain consumption of workers in some major urban centers depended on grain imports from abroad. Thus a reduction in the emphasis on grain self-sufficiency throughout the agricultural sector would mean a greater dependence on state supplies of grain or the creation of a grain market for those units that chose and were allowed to specialize in non-grain production. The new leadership had originally hoped these increased grain supplies could come from the increased output of China's traditional, high-yield grain areas and specifically designated several "commodity-grain production bases" for this purpose.

As a result of encouraging greater specialization in agricultural production, however, there was a reduction in the total sown area devoted to grain and an accompanying increase in sown area devoted to higher yield and/or more profitable crops.[52] In the last two years production of these latter crops has grown very rapidly. Cotton production increased by 25 percent between 1978 and 1980, oil bearing crops by 47 percent, and the output of pork, beef, and mutton by 48 percent.[53] Despite the reduction in cropping area the output of grain has also increased, largely as a result of incentives created by the post-Mao leadership's program of economic reforms. However, between 1978 and 1980 the increase in grain output was only 4 percent. More important from the point of view of increasing specialization and interregional trade in Chinese agriculture were the difficulties encountered by the state in obtaining and redistributing a larger level and share of the grain produced. Between 1978 and 1980 the state's collection of grain through taxes and procurements increased by only one million tons. The significantly higher imports of grain at the end of the 1970s did mean that the amount of grain distributed by the state was larger than it had been in the mid-1950s. Nonetheless, as a result of the drive for self-sufficiency and the attempt to reduce the level of inter-provincial grain shipments in the 1960s and 1970s, the state's marketed share of domestic production had fallen to far less than its share in the mid-1950s. It remained at the relatively low level of approximately 15 percent throughout the period 1977–1980. Thus, following the rejection of Maoist principles of self-sufficiency and the shift to specialization, the production of many non-grain products increased rapidly while the growth of grain output lagged behind and much of this increase in grain output was distributed as income in kind to the peasants.[54]

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[52] While Chinese press reports claim that the reduction in cropping area devoted to grain declined by less than 5 percent, the actual decline must have been much greater. This reflects the fact that production teams undoubtedly reduced the "unreported" cropping area they had formerly used for grain production to meet their yield quotas in favor of using it to grow more profitable crops.

[53] Main Indicators, op. cit. and "Communique on Fulfillment of China's 1980 National Economic Plan," Beijing Review, No. 19 (11 May 1981).

By the end of 1980, an editorial in *Renmin Ribao* summed up the two major problems generated by the rejection of local and regional self-sufficiency in favor of specialization in agriculture. The editorial stated that, on the one hand, even the policy of self-sufficiency had not resulted in the production of enough grain. Secondly, specialization would require large-scale imports of grain, as well as a fully developed transport, storage, and trade/distribution network to supply those areas where specialization would lead to reduced self-sufficiency in grain.

> China is a populous country. . . . Over the last 30 years, our country's grain production has developed greatly. . . but because of speedy population growth, the nation's average per capita grain consumption . . . is a very low standard. . . (and) a considerable number of peasants have insufficient food rations. . . . There are actual problems that we cannot deny. . . . To promote animal husbandry and fishery, we need a large amount of grain. If the average amount of grain per capita cannot be gradually increased, then it is impossible to have enough grain to promote animal husbandry and fishery. . . . Therefore, for a considerably long time to come, our country as a whole must continue regarding development of grain production as a principle task.[55]

While taking grain production as the principle task for the country as a whole, such a policy is not inconsistent with the shift toward specialization whereby the necessary grain is to be obtained by the state from the ten designated bases which specialize in grain production. Yet the editorial quoted above explicitly acknowledges the problems in achieving the necessary grain surplus by this method. As a result of an administered price structure for agricultural products which is fixed and does not approximate true supply and demand conditions in the economy, "the economic benefits of grain crop cultivation are lower than those of industrial crop cultivation."[56] Thus while the production costs of the ten grain production bases are lower than in other areas, their rates of profits remain below that of alternative agricultural activities. Furthermore, because they have been traditionally high yield grain areas, their assigned quota deliveries are relatively high, making it more difficult for them to take advantage of the premiums offered for above-quota deliveries to the state. Finally, if these grain bases were to be relied upon to supply most of the necessary grain for areas specializing in other more profitable economic activities, it would be necessary to increase the tax and quota procurement rates to an excessive (inequitable) level, reducing their income level even further.

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[54] The recreation of rural markets, a reform policy which will be elaborated upon later in this paper, compounded the problem the state faced in obtaining a larger share of the grain produced. Some 35,000 of these markets are reported to now exist throughout the rural areas. In 1979 (when 5 million tons of grain were reported to have been sold on these markets) prices on these markets are reported by various observers to have been more than 50 percent above those paid by the state for above quota deliveries. Sales of grain on the rural markets (from producer to consumer) did not increase the supply of grain available for inter-regional trade and redistribution. The recreation of these markets also made it more difficult for the state to obtain its planned procurements of even those crops whose outputs had increased very rapidly in 1978–80. It was, of course, "illegal' to sell agricultural output on these markets until the quota and above quota procurement deliveries assigned by the state had been fulfilled. However, "instead of transferring their products to other areas as called for in the state plan, some localities have retained agricultural and sideline products needed by the state in their own areas.' See the Xinhua's Correspondent's Commentary, "The Concept of the Interest of the Whole Should Be Strengthened to Improve the Purchase and Transfer of Agricultural and Sideline Products," FBIS (10 November 1980), L. 24

[55] "Pay Close Attention to Grain Production, Do a Good Job in Diversification," Renmin Ribao (12 December 1980), p. 1.

[56] Quotes in this paragraph are from "Pay Close Attention," ibid.

During 1981, therefore, Chinese discussions of this problem have with increased frequency cited the old slogan of taking grain as the key link. It is argued that specialization is aimed at the correction of previous attempts at self-sufficiency in communes obviously ill-suited for growing grain (i.e., pasture lands) or in the use of surplus land and labor not required for growing grain. These arguments go on to call for the strengthening and enforcement of the state's unified grain production and procurement plans. In other words, as is true of most of the new leadership's economic reforms, the principle of specialization was introduced to counter and correct obvious and serious economic problems created by the principle of self-sufficiency inherited from the past. That objective, along with the general principle of specialization, remains. Yet certain developments over the past few years which have resulted from this change in policy have led the new leadership to reintroduce limits or constraints in its implementation. Some of these revisions reintroduce or rely to some extent upon the policies and economic system they inherited.

In the foreign trade sector, however, the rejection of the Maoist principle of self-sufficiency was even more dramatic. In an attempt to justify this shift, Lenin's arguments favoring reliance on foreign assistance, including loans and direct foreign investment (which he used at a similar stage in Soviet economic development) were often cited. The rejection of self-sufficiency was deemed necessary for the development of the national economy. This shift is reflected in the trade statistics for this period. In both 1975 and 1976 China's imports from non-Communist countries were reduced to the point where China enjoyed an export surplus in the balance of trade of over 1 billion U.S. dollars in the latter year.[57] In the last half of 1977, however, China's imports were almost double their level in the last half of 1976. In addition the Chinese had obligated themselves to approximately $600 million in down payments for plants ordered by the end of 1978.[58]

This growing dependence on foreign trade soon led to the negotiation for over 25 billion U.S. dollars from abroad to finance China's tremendous import needs. Recognizing the potentially serious problem that their import needs could mean in terms of foreign indebtedness, they are now seeking low interest loans with very long payoff periods.[59] At the same time, however, the Chinese are attempting to further ease constraints imposed by their limited export earnings on their import capacity by encouraging foreign investment by means of joint ventures, compensation trade, and leasing arrangements. All of these moves signal a policy of involvement in international trade and foreign assistance which obviously reverses a principle basic to the Maoist ideological tenet of self-sufficiency.

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[57] National Foreign Assessment Center, "China : A Statistical Compendium," ER 79–10374 (July 1979), p. 13.

[58] National Foreign Assessment Center, "China : International Trade Quarterly Review, First Quarter, 1980" ER CIT 80–004 (September 1980), p. 17 and ibid., "First Quarter, 1979," ER CIT 79–001 (September 1979), p. 1.

[59] As for these long-term, low interest loans, in March 1981 Ji Chingwei reported that China had successfully negotiated the following : A 400 million U.S. dollars loan from Japan (six construction projects—two ports, three railways, one power station) at 3 percent interest, with repayment of the loan to begin in the eleventh year and to be repaid by the 30th year ; a Japanese Export Bank loan of 1.5 billion U.S. dollars for energy development (coal mines and oilfields) at 6.25 percent interest, repayment in 15 years after each project is completed ; an IMF loan grant of 450 million U.S. dollars, repayment in 30 years. See Ji Chingwei, "China's Utilization of Foreign Funds and Relevant Policies," Beijing Review, No. 16 (20 April 1981), pp. 15–16.

While this rapid growth in international economic involvement has not been smooth, the constraints on that growth are not simply those of China's export growth. Over the past few years many articles have appeared in the Chinese press which argue against the development of a compradore attitude of dependence on and praise for foreigners. These articles focus attention instead on the impressive economic changes the Chinese have brought about over the past two decades "on their own." Equally important in the negative reaction to policies calling for greater reliance on foreign capital and technology are arguments which call attention to the serious problems the Chinese have had in absorbing foreign capital and technology.

Specifically, these projects are criticized on the basis of their foreign exchange costs (they don't produce exports and rely on some imported raw materials), high energy consumption (which requires closing down other factories in the area to provide the necessary energy), skilled labor requirements, poor planning and design, transport requirements, environmental impact, and reliance on foreigners for equipment that could be supplied by the Chinese themselves. As a result the Chinese are now

> Making it a rule that before we agree to a specific project, we must carefully examine the project . . . that is to say, we must take into account the availability of raw materials, energy sources and transport, and make arrangements for the marketing of the project's products, the organization of the required designing and construction personnel, the ancillary parts of equipment, personnel training and managerial skills.[60]

Large-scale projects which pass this test must, as far as possible, "be undertaken using long-term and low-interest or interest-free loans" and utilize equipment the Chinese can produce themeselves. Smaller-scale projects must "yield good foreign exchange earnings" and "both repayment (of foreign loans) and payment of profit (joint ventures) have to come from the earnings of the project." Despite these constraints, however, trade returns for the first quarter of 1981 still show China's imports growing more rapidly than exports—31.1 percent and 15.6 percent, respectively. This surge in imports was led by an 80.8 percent increase in imports of new technology and complete sets of equipment.[61]

In terms of the domestic economy the Maoist emphasis on self-sufficiency had resulted in the creation of independent production facilities within given industries throughout China. Given the bureaucratic administration of the distribution of industrial products and often operating with an undependable source of input supply, these plants became comprehensive units which produced as many of the component parts as possible. The gains from greater specialization in industrial production were obvious to the post-Mao leadership. Accordingly they introduced a program of rationalization and amalgamation of enterprises within an industry into associations or companies to help the relevant enterprises "move faster towards specialization in production irrespective of their localities and system of ownership."[62] "According to statistics from 28 provinces, municipalities and autonomous regions, 19,300 enterprises had been amalgamated into 1,900 specialized companies or general plants by the end of 1980."

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[60] Ji Chingwei, op. cit. Quotes in this paragraph are from this source.

[61] "China's Foreign Trade Expands," Beijing Review, No. 17 (27 April 1981), p. 8. Trade returns for the first six months of 1981, however, do indicate the attempt to limit the dependence on imports of complete plants from abroad had begun to have an effect. Imports of machinery and equipment have declined compared with their level in the first six months of 1980. Nonetheless, these six month trade statistics show that due to imports of agricultural products, imports have continued to grow much faster than exports. In the first six months of 1981 alone China has incurred an import surplus in the balance of trade of almost one billion yuan.

Nonetheless, while this amalgamation for the sake of greater specialization is quite rational when viewed from the standpoint of national interests, the individual enterprises in China still are owned by different administrative units in the political system that range from provinces, counties, municipalities, the state, and even communes. What is good for the country is not always beneficial to the unit that owns the individual enterprise. Thus the owners of individual plants have been assured that joining one of the new specialized companies will not involve a transfer of profits or loss of profit. Apparently these assurances have not been enough, however, and it is now argued that higher levels of authority must take the lead in obtaining "voluntary" participation by these various units for the sake of national interests.

Finally, within the individual enterprise itself, the former practice of organizing production by means of collective groups of workers in work groups is being replaced by assigning tasks to specialized work groups. Members are allowed to democratically elect their work leader and organize their own internal work assignments. They are also rewarded for their above-quota production. To the extent this system is adopted throughout China's industrial sector it is only a matter of time before these workers will discover that specialization in task assignments results in greater output.

The post-Mao leadership has had little trouble justifying a related shift from Maoist principles of egalitarianism and reliance on normative incentives. They have simply quoted from the fundamental economic law of socialism found in the basic texts of Marx: "From each according to their ability, to each according to work done." In agriculture households with less labor power and skills had benefitted from the Maoist emphasis on more equitable distribution of the production team's income. At the same time, however, the attempt to increase output by means of mass campaigns and normative appeals meant that while the production team might increase its production, this was not matched by an equivalent increase in the team's income. In fact, inasmuch as the price paid for quota deliveries to the state rose little over the past two decades while the quantity of purchased inputs and labor per unit of output rose, the average income per capita of the peasants had not increased significantly between 1957 and 1977.[63] Furthermore, in an attempt to increase the size of the basic unit to share this poverty more equitably, the Maoists had pressed for the elevation of the basic unit of decision making, accounting, and income distribution from the lowest level of the commune—the production team—to the intermediate level—the brigade.[64]

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[62] "Restructuring of Industry," Beijing Review, No. 17 (27 April 1981), p. 5. Statistics and quotes in the remainder of this paragraph are from this source.

[63] In 1977 the national average of net per capita income (from all sources, not just income distributed by the collectives) was 117 yuan. "Further Economic Readjustment: A Break With 'Leftist' Thinking." Beijing Review, No. 12 (23 March 1981). In 1955 the national average was 94 yuan. "Problems Concerning the Living Standards of Peasants and Workers." T'ung-chi Kung-tso (Statistical Work), No. 3 (14 July 1957). This yields an average rate of growth of one percent a year over these two decades, while the gross value of agricultural production was increasing by approximately 4 percent a year.

Production teams and brigades are part of the collective sector and, although they were under tremendous pressure from political leaders and local level cadre to implement Maoist income distribution schemes during the period of leftist ascendency that preceded his death, actual implementation varied widely. In all methods the annual net income of the accounting unit was distributed to its members on the basis of work-points earned during the year for work in the collective. At one extreme were distribution systems that gave individual peasants work points according to the type of tasks done and the quality and quantity of work accomplished. At the other extreme were schemes in which individuals were awarded a monthly or annual amount of work points; i.e., share of the collective's net income, on the basis of their "merit" as a member of the collective. This was determined at a meeting of the collective's membership and was based on political and social factors in addition to economic ones. The latter scheme, that advocated by the Maoists, not only resulted in a more equitable distribution of net income, but also weakened the relationship between an individual's income and the quantity and quality of the work they did. Over the previous two decades these Maoist policies of expanding the basic accounting unit to the level of the production brigade and distributing income on the basis of merit rather than strictly economic factors, had become widely accepted throughout many areas of rural China.

When the post-Mao leadership came to power, they set about to pressure the county and commune level cadre to restore the production team as the basic unit for decision-making, accounting, production responsibility, and income distribution in agriculture.[65] They were also instructed to stop the practice of issuing policy decisions, plans, and quotas as administrative orders from above and to consult with the teams in implementing these decisions. In addition, they were to stop the requisition and allocation of team resources and income without compensation. Team leaders were now to be elected and the members of the team were to decide on the income distribution scheme they desired. At the same time, however, the new leadership made it quite clear that the distribution of income on the basis of quantity and quality of work done was a basic law of socialism. In this context they provided a flood of empirical studies to show the positive benefits in terms of both greater productivity and higher income in those communes which relied on task specific rather than person specific work point systems. As a result, over the past few years, those communes that had adopted a more Maoist scheme of income distribution have adopted a material incentive income distribution scheme which directly relates a peasant's income with work performance.

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[64] Except for large-scale farmland reconstruction activities the agricultural production activities continued to be carried out by the work groups within the production team.

[65] One of the documents which the Third Plenum agreed to distribute for trial use was "Regulations on the Work in Rural People's Communes (Draft for Trial Use)." This document was a revised version of the "Sixty Articles" or "Regulations on the Work of the Rural People's Communes (Revised Draft)" which had contained these same right-wing principles and was issued by the Central Committee in September 1962 after the failure of the Great Leap Forward. The "Sixty Articles" and the principles it contained, however, were the subject of Maoist attacks during the Cultural Revolution. In the two years following the Third Plenum most of the principles included in the "Sixty Articles," including those discussed here, have been implemented by the post-Mao leadership.

Yet, task specific work points are difficult to determine in China's multiple task agricultural system. Issues of quantity and quality must incorporate a variety of tasks that encompass the entire agricultural cycle of planting, cultivating, and harvesting. Furthermore, the number of skilled bookkeepers required to award and record these work points would greatly exceed the available supply. In response to this problem, in 1978, a system of contract responsibility was discussed and has since gained widespread acceptance in China. Under the contract system, an individual, household, or work group within the team accepts responsibility for producing crops on a particular allotment of land, or agrees to complete a non-crop production assignment, such as pig raising. The contract determines specific quantity and quality criteria for the output which is to be delivered to the team in exchange for a fixed number of work points. Any production above that agreed to in the contract can be kept and disposed of by the producer(s) responsible for meeting the contract.

There is ample evidence that this change in policy to both permit and encourage material incentives and income distribution based on work done has been enthusiastically supported by the major portion of China's peasants. It is also clear that it is responsible, at least in part, for the increase in agricultural production and, therefore, peasant income from work in the collective sector. Those who suffer from this reversal from Maoist distribution schemes include the aged, disabled, military dependents, the less skilled, etc. In an attempt to protect those households who are unable to earn a minimum standard of living through their own production efforts, the new leadership continuously urges the production team to look after their needs. In other words, less productive households must depend on the charity of their fellow team members and the production team's welfare fund.[**]

The contract responsibility system has become so popular that many communes, with the approval and—very recently—the encouragement of the new leadership, have developed contract schemes that come very close to changing the basic nature of China's collectivized agriculture. These schemes, along with other reforms through which the new leadership proposes to change the inherited Soviet economic system, will be discussed later in this essay. The point to be made here is the extent to which they contribute to a rejection of Maoist concepts of normative incentives in favor of material and task specific ones.

[**] The charity of those who earn more work points; that is, larger than average share of the team's net income, referred to here is that involved in the team's distribution on income in kind (grain, on the basis of need). This has always been a feature of China's collectivized agriculture and continues to hold true today. When the accounts are balanced and the household's collective income is determined grain distributed in this manner is charged aganist the work points earned by the household. Those who have not earned enough work points to "pay for" the grain distributed to them in kind incur a debt to the collective. This is to be repaid in cash, but more normally through work points earned in the future. Those households with limited ability to earn work points (mentioned in the text) are unable to make up these debts they incur over the years. However, refugee reports indicate that the team members and leader have a "charitable" attitude towards these debts and do not try to collect them. The new leadership's program of material incentives in agriculture both calls for collecting these debts to clamp down on "free riders" and argues that unfortunate households that would face extreme poverty as a result of the new incentive program be looked after. In cases where the team as a whole is too poor and the grain distributed in kind is insufficient to maintain a minimum standard of living for its members, there are state supplied grain subsidies and a new line item has been introduced in the state's budget calling for direct financial subsidies to these communes as well. This item, which first appeared in the 1980 budget, called for 500 million yuan, a figure which is less than one-half a percent of total expenditures. See "Report on Financial Work, Beijing Review (29 Sept. 1980), p. 17.

Equally important to the production incentives provided by material incentives are the increases in prices paid for agricultural commodities sold to the state. At the Third Plenum of the Central Committee, it was decided that the procurement prices for agricultural products should be increased by approximately 20 percent. Beginning with the summer harvest of 1979, the state's purchase price of 18 major farm products, including grain, cotton, edible oils, hemp, sugar cane, beets, pigs, cattle, sheep, fish, eggs and cocoons were increased. In 1980, the purchase price for cotton, hemp, and sheep received a further increase.[67] These price hikes were felt necessary to respond to the steady erosion of the rate of profit in the production of these crops over the previous two decades that had resulted from the stable procurement prices for commodities, relative to the rising real and money costs for producing them. Thus, they worked not only to stimulate output and productivity but also provided a windfall, catch-up in peasant incomes which had not increased significantly over the same period.

There are several aspects to this increase in procurement prices that are important to note. First, this 20 percent increase in prices was not implemented unilaterally. Depending on such criteria as existing relative productivity and the relative urgency or need to increase supply, procurement prices for individual agricultural products were increased at differential rates which varied from 10 to 40 percent. This use of differential price increases was an obvious indication of the new leadership's desire to rely on material incentives; i.e., price responses of the peasants, to obtain not only a higher level of output in agriculture, but the desired product mix in production as a whole. Secondly, the average 20 percent rise in procurement prices was restricted to those 18 commodities, but they accounted for the dominant share of farm sales to the state. In addition, this price rise is the largest single such increase for any two year period over the past three decades. As a result, these price increases are a major explanation for the 16.1 percent increase in the average per capita distributed collective income during this same period.[68] Finally, in addition to providing both a production incentive and income subsidy to the peasants, these price increases were also meant to increase the share of production delivered to the state. For this purpose a further price increase of 50 percent was adopted for above quota sales to the state for those commodities with the greatest priority within the state's procurement program, such as grain and cotton.

For all three reasons: production incentives, income adjustments, and state procurements, these price increases were long overdue. Their success in terms of the first two objectives—agricultural output and peasant income—can be seen in the relatively rapid increase in both these areas since 1977.[68a] Yet even this most rational and popularly supported of the economic reforms—the implementation of agricultural procurement price increases—has generated serious problems. Foremost among these is the financial problem. In many cases the increase in procurement prices, especially the above quota premium prices, put the purchase price above the wholesale price at which these commodities are sold. This caused the state's supply and distribution agencies to incur losses. In 1979, state subsidies to cover these losses came to 7.8 billion yuan (20 percent above the estimate in the draft budget) and accounted for 46 percent of the total budget deficit in that year.[69] Furthermore, despite instructions to the contrary, some state procurement agents attempted to avoid these losses by regrading the quality of agricultural products offered by the units in order to pay a lower procurement price. Similarly they sometimes simply refused to accept above quota commodities offered for sale by the communes.

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[67] See U.S. Department of Agriculture, "Agricultural Situation: People's Republic, Review of 1979 and Outlook for 1980," pp. 4 and 47; and ibid., "Review of 1980 and Outlook for 1981, p. 5. See also, paper by Frederic M. Surls and Francis C. Tuan on "China's Agriculture in the Eighties," in this volume.

[68] "This year (1979), the income of the rural people's communes, production brigades, production teams and the individual peasants will increase by an estimated 13,000 million yuan, as a result of higher purchase prices for farm and sideline products, reduction or remission of agricultural tax in some areas and expansion of agricultural production." Hua Guofeng, "Report on the Work of the Government." (1979), op. cit., p. 15.

The wholesale prices of basic necessities are still set by the state and, as is true of most socialist countries, low prices for necessities are regarded as one of the few basic rights of the people. In China, a developing country in which agricultural products make up a large share of the consumers' budget, over the past three decades these necessities have been rationed and their prices kept artificially low and stable. Yet it became increasingly clear that some degree of rationalization was necessary and, at the end of 1979, the wholesale and retail price of non-staple agricultural goods were raised. Although basic, staple necessities such as grain were not increased, the "official" increase in the retail prices of foodstuffs amounted to 13.8 percent in 1980.[70] The failure to increase all wholesale and retail prices to a level higher than the existing procurement prices meant that the state had to continue to subsidize the losses to the state's procurement and supply system. In the 1980 draft budget this amount was estimated to amount to 5 billion yuan for above quota purchases alone.[71] On the other hand, the increase in some retail prices aimed at reducing this subsidy merely led to worker discontent and demands for wage increases. To offset this loss in real wages by urban workers the state granted them a five yuan per month wage supplement. The 1980 draft budget estimates this will cost 12 billion yuan.[72] Finally, the increase in wholesale prices for agricultural products purchased by state industrial enterprises reduces their profits. This is listed as one reason for the decline in state revenue in the draft budget for 1980, although no specific estimate of actual amount is presented.

[68a] As mentioned earlier in the text with regard to grain, these price increases have not been as successful in achieving the third objective, that of increasing the state's share of the increase in agricultural production resulting from the price response of the peasants. The reason for this is the impact of another economic reform introduced in agriculture by the new leadership which will be discussed below: the recreation of rural markets as another means for stimulating production and increasing peasant incomes. Despite the increase in state procurement prices, until very recently the prices on these rural markets were considerably higher. It was, of course, always "illegal" for the collective to sell products on these markets until they had fulfilled their quotas for sales to the state, but the Chinese press contains many reports that indicate poorer quality output was used to meet the quota and/or some collectives sold commodities on the rural markets even though their quotas for deliveries to the state had not been met.

[69] Wang Bingqian, "Report on Financial Work," op. cit., p. 12. The reduction and remission of taxes by those communes considered as still suffering poverty levels of income amounted to 2 billion yuan in the 1979 final budget accounts.

[70] Yao Yilin, "Report on the Readjustment of the 1981 National Economic Plan," op. cit., p. 15.

[71] Wang Bingqian, "Report on Financial Work," op. cit., p. 16.

[72] Ibid.

The attempt to raise agricultural procurement prices to achieve the set of objectives mentioned above has been rather successful. However, unwilling to undertake a complete reform of the whole administered price system, this increase has also created a whole set of new problems. This is, of course, a valuable economic lesson and merely supports those who argue for a complete reform of the entire price system. Inasmuch as the new leadership now views the budget deficit as their most serious problem it is unlikely there will be further rounds of price increases for agricultural products in the near future. Nonetheless, their positive impact can be measured both in the extent to which they were successfully implemented in 1979 and 1980 and the enthusiasm and support they received from the peasants. It also serves as a clear indication of the new leadership's rejection of Maoist principles of normative incentives, mass campaigns, and a more equitable distribution of income in the agricultural sector.

In industry, wage incentives within the eight-grade wage scale have remained a basic feature of China's economy since the 1950s. The Maoist emphasis on egalitarianism and normative appeals has been a matter of relative importance. At the same time, however, in the name of Maoist principles, wage increases, piece rates, bonuses, and promotions had either been eliminated or greatly reduced over the previous two decades. The average wage of staff and workers in state enterprises declined by 5 percent between 1957 and 1977.[73] However, the post-Mao leadership's attack on Maoist principles of normative incentives and egalitarianism in favor of material incentives has had an impact. In the last quarter of 1977, 40 percent of workers and staff members in lower grades were promoted into higher wage brackets and another 20 percent were to receive an increase in their wages.[74] In 1979, another 40 percent received pay raises and wage scales were "readjusted" in certain regions. In addition to increases in wages and salaries, a bonus system was reintroduced which was to be paid for out of increased profits, for above quota performance.

As has been pointed out above, however, other economic policies created problems which threatened to counteract the material incentives of higher wages for workers and led to considerable urban unrest. As a result of the state's increase in prices paid to peasants and the introduction of "free" markets for peasant subsidiary products in the cities, urban workers were faced with higher retail prices for agricultural goods. As mentioned above, urban workers were each given a 5 yuan monthly supplement in an attempt to counter these inflationary effects on urban wages. As a result of this and other material incentives programs, the average per capita disposable income for worker and staff members' households increased by 7 percent in 1978, 9.4 percent in 1979, and 9.6 percent in 1980. At the same time, however, these increases in workers' incomes are said to be one of the factors contributing to the state's budget deficit, the excess demand for consumers' goods, and the inflation.

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[73] Main Indicators, op. cit., p. 9. Per capita income of households of staff and workers did increase over this period due to the increase in workers per household and decline in household size; i.e., dramatic decline in dependents per staff member and worker.

[74] Yu Quili, "Report on the Draft of the 1979 National Economic Plan," FBIS (2 July 1979), L 13.

There is no doubt that the overwhelming majority of China's workers and staff members in industry have welcomed this fundamental return to relying on material incentives. Yet the success of material incentives in economic terms such as greater efficiency and productivity in industry must be measured according to actual increases in those areas. Given the long period of frozen wages and promotions, however, much of the wage increase was viewed as the repayment of a debt owed for work done in the past. Over the past year even the post-Mao leadership has begun to regard these wages as a necessary "catching-up" process. They argue that given China's present level of development and financial difficulty, the state will be unable to repay all these past debts for some time to come.

This principle of making across the board wage adjustments is most common in the awarding of bonuses. Not only is it difficult in many enterprises to determine who or what group is responsible for the overfulfillment of production targets, it is feared that the selection of individuals or small groups as recipients for bonuses is actually divisive and counterproductive, rather than providing an incentive for greater effort. Most important, determining bonuses on the basis of profit can result in the payment of large bonuses to unproductive workers employed in high profit industries, while more productive workers in relatively low profit industries might receive small bonuses. (Relatively high and low profits being determined largely by the state's administered price structure). Once the principle of awarding bonuses was reintroduced, however, and along with workers' demands to "catch up," many reports of enterprise managers unilaterally awarding bonuses far in excess of the approved amount have appeared in the Chinese press.

While the methods for distributing income in the collective sector and the use of higher procurement prices were important means for creating material incentives in the collective sector, the reversal of the Maoist attempt to eliminate "the vestiges of capitalism" was of even greater importance to the peasant. When originally introduced, collectivization in China included the provision of private plots (5–10 percent of the collective's arable land) and allowed the peasants to engage in private sideline production (handicrafts) and services (transportation). It also permitted rural "free" markets where the peasants could sell and buy these products and services. In 1957, per capita peasant income from the private sector accounted for a significant share of their total; ranging from averages of 18.6 percent in Northwest China to 33.6 percent in South China.[75] Maoist attacks on these "vestiges of capitalism" in the agricultural sector were dominant features of the periodic anti-rightest campaigns which, along with the Cultural Revolution in the late 1960s, reduced these activities considerably. Rural markets were virtually eliminated and where private plots continued to exist, they were either utilized collectively or for the purpose of self-provided consumption. Thus, whereas total per capita peasant income increased by only one percent a year be tween 1955 and 1977, this included a higher rate of increased income in the collective sector.[76] Incomes from the private sector actually suffered an absolute decline over this period.

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[75] Kenneth R. Walker, "Planning in Chinese Agriculture" (Chicago: Aldine Publishing Company, 1965), p. 34.

The principles of private sector production were among those set forth in the "Sixty Articles" issued by the Central Committee in September 1962. These were reissued in revised form by the Central Committee in December 1978 by the present right-wing leadership which uses Marxist texts to come up with an economic law of socialism which denies the need to eradicate "the vestiges of capitalism." This is in apparent response to a considerably entrenched belief in the Maoist proscription, especially among many lower level cadre. The post-Mao leadership argues that as long as the socialist economy plays a dominant and controlling role, private markets and income earning activities should be encouraged in order to fill in the gaps and to increase the people's standard of living. The real question in the economic laws of socialism is not over the existence of private ownership of the means of production in the socialist stage, as it is accepted that all three types of ownership—the state, collective, and private—will exist in the initial stage of socialism. The question is whether the transition from the three types of ownership to ownership by the state alone will be carried out within the socialist stage or be a primary feature of the transition from socialism to communism. At the present time there would appear to be a disagreement between those who argue that private ownership will remain throughout the socialist stage and those who believe it will be eliminated as the level of economic development permits. Both groups, however, believe it should be permitted at China's present level of economic development, as long as the state sector dominates and controls economic activity in industry and the collective sector does so in agriculture.

This abrupt shift in policy in support of private plots, peasant sideline activities, and markets (trade fairs) has encountered restrictions and interference from local cadre in some areas. Yet it has been enthusiastically supported by the overwhelming majority of the peasants. Guidelines issued by the post-Mao leadership have led to a steady increase in the upper limit for private plots to its present maximum level of 15 percent of the production team's arable land.[77] Peasants use this increased production from private plots and sideline activities mainly to supplement and provide greater variety to their consumption from the collective and the state's supply system; i.e., the major source of their foodstuffs and consumers' goods.[78] Yet the resulting increase in their income—both in cash and in kind—from these private sector activities over the past few years has been remarkable. In 1979, average per capita total peasant income increased by 19.9 percent over the previous year. This figure represents a 14.6 percent increase from the collective sector while that from the private sector increased 32.1 percent. Income from the private sector—in both cash and in kind—accounted for 36.3 percent of the peasants' total income in 1979.[79] Over 35,000 "rural" markets have been reopened, over 2,000 of them in urban areas where the market demand for the peasants' sideline products is greatest. The State Statistical Bureau, which is responsible for making estimates for the volume of sales on these peasant markets in urban areas, reports that the peasants sold 6.9 billion yuan worth of commodities "to the non-agricultural population" in 1980.[80]

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[76] See note 63.

[77] In a survey of 10.282 households in 23 provinces, cities, and regions, the average private plot per household was one (one-fifteenth of a hectare) per household. NCNA, (2 January 1981).

[78] The same survey cited in note 77, above, reports that 83 percent of the private plot was used for self-provided consumption.

[79] Same source as referred to in note 78.

The restoration of private sector economic activities as a supplement to the collective economy in rural China and the protection and encouragement of this sector by the post-Mao leadership is undoubtedly one of its most welcome and successful new policies. Despite the reservations and even outright opposition of some party members at all levels (most especially those at lower levels who argue that this change in policy, more than any other, will lead to the return of capitalism), the rural private sector is one of the most dynamic economic sectors in China today. It offers peasant households with labor power and entrepreneurial skills a means to use their resources to produce self-provided consumption and earning income that has been denied them for a decade or more. They have reacted to this new opportunity with a vengeance, and one that is not always favorable to the state. For example, the quality of products offered on these markets is much better than that of commodities made available by the state's supply system and retail network. The prices on these markets are also higher than those paid by the state's procurement agencies.

As a result, the state has encountered difficulty in fulfilling its planned quotas for some commodities which not only the peasant households, but the production teams as well, find ways to sell on the higher priced market. On the consumer supply side, state retail outlets have also encountered difficulty selling some products and services in competition with the higher priced, but better quality goods and services, available through the markets. In short, while the total amount and variety of commodities, peasant incomes, and the satisfaction of consumer demand has definitely increased, in many cases the state sector finds itself losing out in competition with this sector. Not surprisingly, therefore, many guidelines and official rules issued by the authorities over the past year have aimed at making these private sector activities in agriculture more closely serve their intended role as a supplement to the collective and state sector's planned economy.

These new guidelines address this problem in several ways. Commodities within the state's unified supply system must be delivered to the state's procurement agencies to fulfill the assigned quotas and also offered to those agencies as above quota deliveries. Only those not needed and purchased by the state supply system can be sold on the rural markets. Prices are to be openly displayed and local authorities are to supervise these markets to prevent unwarranted or arbitrary "profiteering." Peasants legally participating in these markets are not to be interfered with, but the quantity of goods they can offer for sale must be carried on their backs, pulled in carts, or carried on bicycles. They are not permitted to use trucks or engage in trade over long distances. Yet even these new guidelines contain the implicit recognition on the part of the post-Mao leadership of the importance of activity in the private sector as a means of supplementing collective and state derived income. This belief has been vindicated by developments over the past few years and has contributed significantly to an increased standard of living in rural China.

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[80] "Communique on Fulfillment of China's 1980 National Economic Plan," Beijing Review, No. 20 (18 May 1981), p. 17. This undoubtedly is an underestimate of total market sales by peasant households of their sideline production.

In the industrial sector, the transition to socialism and the state ownership and control of all enterprises was accomplished by the end of the 1960s. Thus most urban dwellers earn their incomes as workers employed by the state. Yet in these last few years, growing unemployment and the recognition that the Maoist decade led to a severe reduction in service trades has caused the new leadership to encourage unemployed persons to organize cooperative units or even engage in private entrepreneurial activities. Through this means they can provide both consumer services—restaurants, tailoring, baggage handling, peddling, etc., and a means to earn a living to the unemployed. As a result, the urban areas have become a beehive of such activity.[81] Vendors, food stalls, and various other small-scale private enterprises can be seen on almost every street corner. As these small cooperatives and private entrepreneurs also began to lure customers from the state stores, the post-Mao leadership was faced with some serious choices. For example, some of these young entrepreneurs felt free to charge what the traffic would bear; others made more money than they would have in industry, etc.

The post-Mao leadership's reaction to these problems has been somewhat mixed. While they recognize there is nothing wrong with making money by supplying what consumers need, they maintain that these profits should be progressively taxed, prices controlled, and all illegal activities (what is and what is not profiteering?) should be severely dealt with. "Exploitation;" that is, hiring workers for wages, continues to be forbidden, but unemployed workers can be hired as "apprentices." Nonetheless, the Chinese press contains many articles reporting complaints of local authorities harassing those engaged in legitimate private or small-group cooperative production of goods and services. As in the private sector in agriculture, the guidelines issued by the new leadership most recently have argued that local authorities should not interfere with these legitimate private or cooperative businesses, should give them tax concessions if their profits are too small to keep them in business, should not levy any arbitrary fines or taxes on them, and should include their raw material needs in the state unified supply system.

Another shift from Maoist principles of economic development has been away from the principle of the participation of the masses in decision-making. In agriculture, where the lowest level of production was the production team, the right-wing had always argued that this unit should be the basis of decisionmaking, accounting, and income distribution and that the decisions of the team should involve the participation of its members. As a unit in the collective sector, the production team was not a state enterprise and its production plans and quotas for deliveries to the state should reflect consultations and negotiations between the team and higher level authorities—they should not be assignments given them by these higher level officials.

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[81] The number of individual businesses "in cities and towns" increased from 310 thousand in 1979 to 810 thousand in 1980. "Communique of Fulfillment of China's 1980 National Economic Plan," Beijing Review, No. 20 (18 May 1981), p. 20. According to a survey of 80,955 families of wage and salary earners, "other income" amounted to only 36 yuan a year, or only 1.5 percent of total household annual income.

Yet the creation of the communes to replace the traditional *xiang* (township) functions of government administration and the use of state-appointed cadre meant that local cadre acted more as administrators who imposed decisions from above than as representatives of the teams. Furthermore, the carrying out of Maoist mass campaigns in the rural areas and the implementation of the Maoist principle of enlarging the basic level of decision making, accounting, and income distribution, had further removed the locus of local authority. As a result, higher level authorities requisitioned the team's resources, labor, and income and imposed allocation, production, and distribution plans with a minimum of consultation.[82]

Strangely enough, it is the post-Mao leadership that has sought to ensure that the masses; i.e., the production team members, will participate in making these decisions. The production team, where appropriate, is to be reaffirmed as the basic decision making, production, and income distribution unit in the collective sector. The team leader is to be democratically elected. Production and delivery quotas are to be determined through consultation and negotiations with the team (taking into account special local features and circumstances), not imposed by higher level authorities. Higher officials are not to requisition resources, labor, or income from the team without compensation. In short, the general principles of organization and functioning for China's collective agricultural sector (as spelled out by the right-wing in the 1962 and 1978 party documents mentioned earlier) are to serve as the model.[83] There is little doubt the post-Mao leadership will persist in its attempt to implement these principles, despite the resistance of local authorities in the commune and local level bureaucracy who continue to issue orders and assignments to the production teams as they have in the past.[84]

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[82] For a discussion of the many "external constraints" imposed upon the production team which seriously interfere with its ability to determine and achieve its maximum potential output and income, see Robert F. Dernberger, "Agriculture in Communist Development Strategy," in Randolph Barker and Radha Sinha, eds., The Chinese Agricultural Economy, forthcoming.

[83] Article 20. Production teams are the basic accounting units in a people's commune. They carry on independent accounting, assume responsibility for their profits and losses, directly organize production of grains. Once established this system shall remain unchanged for at least thirty years.

Article 21. All the land within the production team belongs to the production team. . . . The labor forces within the production team are at the production team's disposal.

Article 22. The production teams have the free-will to manage production and distribute grains. . . .

Article 38. The production team must fully practice the system of democratic decision management of the team, and bring to the full the activism of making (the) members the masters. All important things such as the team's production and income distribution must be decided through discussions at a general meeting of (the) members, and not by the cadres.

From "Regulations on the Work of the Rural People's Communes (Revised Draft) ;" i.e., the "60 Articles," Documents of the Chinese Communist Party, Central Committee, Volume 1 (Hong Kong: Union Research Institute, 1971), pp. 695–725. The revised version of the "60 Articles" issued by the Third Plenum has not been published, but what is claimed to be a copy of the documents distributed by the Third Plenum has been published in Taiwan. See Chung-kung yen-chiu, Vol. 13, No. 5 (15 May 1979), pp. 150–62 and No. 6 (15 June 1979), pp. 139–52.

[84] Local level cadre who continue to obstruct the implementation of this and other post-Mao reforms are presently being attacked for their "feudal mentality." Yet the post-Mao leadership admits that Maoist sentiment does not lie at the root of all this resistance. Some cadre, based on their experiences in the past, are adopting a "wait-and-see" attitude; i.e., we have been through this before and sooner or later policies will be changed again. Other cadre, acting out of self-interest, fear they will lose power and their jobs will be more difficult if they implement these new policies. Finally there are those that try to comply with the new policies, but do so in name and not in spirit. They implement the new reforms, introducing some minor changes, but continue to do things basically as they have always done.

Within industry this shift in the nature of decision making has resulted in important changes. With the renewed emphasis on skills and expertise, specialization and the division of labor, and economics in command, the principle of "one-person management" of enterprises has begun to reemerge, as has the hierarchy of authority and responsibility within the enterprise. Revolutionary Committees, created during the Cultural Revolution to promote participation and control by the masses, have been disbanded. Party cadre are now instructed to "stand-aside" and not interfere with the day-to-day activities of an enterprise, as the managers had been forced to do during the Cultural Revolution. While these developments certainly reversed the Maoist principles of enterprise management, they also have created a dilemma for the new leadership. Who within the enterprise would serve as a check on the enterprise manager, now that he or she had regained considerable power over the operations of the enterprise? The Trade Union had been revived and might possibly serve this function, but it was a national mass organization and its interference in the operation of an individual enterprise was less preferable than that of the party. The leadership has, therefore, for both purposes of control and to provide worker incentives, introduced the system of workers' congresses in the enterprises. By the fall of 1980 these congresses of staff and workers had been established in over half the state owned enterprises. In principle these congresses are to be democratically elected, have the right to manage the enterprise (i.e., "discuss and decide major questions"), and to elect and dismiss administrative leaders (i.e., "the right of supervising the cadres").[85]

At the present time, however, reports in the Chinese press make it clear that while some enterprises have been given greater rights of self-management, they "have not given the expanded self-management rights to their staff and workers." They go on to say that many of the congresses that have been established only achieve "a repetition of 'leaders making appeals and the masses making pledges.' "[86] Of course, workers are also told "there is still the need for a unified and centralized system in production and management . . . and the enterprise should exercise highly centralized leadership in administration." In short, this amounts to the creation of "democratic centralism" within enterprise management. As the Chinese press acknowledges, "the protracted erosion by feudalistic paternalism and by the ideology of seeking special privilege, the leading cadres of many enterprises still lack a profound understanding of the fundamental issue that the staff and workers are the masters of their enterprise." As a result "the congresses of staff and workers . . . are still in an embryonic stage."

The preceding review should be sufficient to indicate the extent to which the economic policies of the post-Mao leadership represents a wholesale rejection of the Maoist economic ideology. This review has also emphasized the numerous difficulties encountered in their attempt to replace Maoist principles with their own economic laws of socialism.[87] It has also pointed out that despite the counter-productive impact of Maoist principles on China's economic development, that leftist resistance does continue. At the same time, however, there has been significant popular support for these new economic reforms. Furthermore, despite these obstacles and some of the particular economic consequences of these reforms, the rejection of Maoist policies is considered to be the most successful aspect of the post-Mao leadership's economic reform program. The campaign to reject the Maoist model which began immediately upon the right-wing's reascendance to power continues today and, despite the many obstacles and difficulties encountered, will undoubtedly continue in the future.

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[85] "Gongren Ribao Reports on Congresses of Staff Workers," *FBIS* (7 October 1980), L 1–3.

[86] "Xinhua Comment," *FBIS* (7 October 1980), L 3–5. Quotes in the rest of this paragraph are from this source.

THE POST-MAO LEADERSHIP'S PROGRAM OF ECONOMIC POLICIES: REFORM OF THE STALINIST STRATEGY

By the end of 1978, it was clear that China's economic problems were not merely the fault of the Maoist model. The Stalinist strategy also bore its share of the blame. The high rate of accumulation and investment and the concentration of that investment in heavy industry, especially key basic industries such as metals and machine building, had led to the creation of serious imbalances that threatened the capacity for further growth. Most problematic of these were serious shortages in the energy and building materials industries within heavy industry, shortages of consumers' goods due to the neglect of light industry and agriculture, and serious bottlenecks in transportation and housing resulting from the neglect of service sectors. Over time, the Stalinist strategy and priorities in the allocation of investment and stress on increases in output had created the mentality of investment and production for its own sake, irrespective of how useful it was in the long-run development of the economy. In fact, the enterprise was considered successful if it was able to meet its output target. Further, that output was added into the gross value of industrial production, even if no one wanted it and it ended up in accumulated stocks. As a result, per capita gross value of output would show an increase, even though actual per capita consumption remained relatively stagnant.

In order to change this traditional Soviet mentality the post-Mao leadership felt it necessary to develop another economic law of socialism: the end of socialism was not production for production's sake, but to improve the people's standard of living. It is ironic that they found the needed justification for this economic law of socialism in the writings of Stalin.[88] More relevant was the argument they used to show how production for its own sake was self-defeating and would lead to a situation where "expanded reproduction" was impossible. Changing this traditional strategy of growth in practice, of course, required a dramatic change of priorities in the allocation of investment and resources.

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[87] Attention has been drawn to the contribution of the post-Mao leadership's policies and their rejection of Maoist principles to the macro-economic problems of import surplus, budget deficits, inflation, etc., which they face; i.e., those current economic problems summarized in an earlier section of the text. Mention should be made, however, of another economic problem which they face at the present time. This is one which has been explicitly created by the rejection of the Maoist principle of egalitarianism in favor of relying on material incentives: a more inequitable distribution of income. As a result of the post-Mao leadership's economic policies and the restoration of private sector activities income distribution within the agricultural and industrial sectors and between the urban and rural sectors has become significantly less equal over the past two years. Although the introduction of more progressive tax and subsidy schemes as a means of redistributing income more equitably have been discussed in articles in the Chinese press, the overwhelming arguments presented are justifications of the higher incomes being earned by certain groups, localities, and individuals as their just and necessary incomes to induce and reward their greater contributions to China's economic growth; i.e., the basic purpose of the material incentive schemes introduced by the post-Mao leadership.

The most important economic sector in terms of China's modernization is agriculture and, as is true in most socialist countries, it was this sector which had suffered the most from the Stalinist model priorities in the allocation of investment funds over the past three decades. From 1966–75 the share of the state's budget for agriculture was only 11.5 percent. In 1979, however, the revenue side of the state's budget included provisions for reduced revenues due to the price increases for quota and above quota purchases and the reduction or remission of agricultural taxes "in some places." It was estimated in the draft budget that these measures would boost agricultural incomes by 7 billion yuan. When the final accounts were drawn up, however, the figures indicated that this actually amounted to over 12 billion yuan. On the expenditures side the state's capital construction allocation was planned to increase from 10.7 percent in 1978 to 14 percent in 1979. This figure for the state's planned investment in agriculture was exceeded by 28 percent. Despite the budget deficits and inflation, these price subsidies, tax concessions, and higher levels of investment in agriculture were continued in the 1980 and 1981 budgets.[89]

Nonetheless, because agricultural production is carried out in the collective sector, direct state investment is limited. In the state budget most of the allocation for agriculture is directed at large scale irrigation water control projects. Unlike industry, a considerable share of investment is self-provided by the communes or financed by bank loans. As a result of the new emphasis on material incentives and increases in collective and individual incomes in the rural areas, savings have increased. By the end of 1980 the savings deposits of communes and production brigades, commune and production brigade run enterprises, and individual peasant households in rural credit cooperatives increased to a level of 27 billion yuan. In addition, the deposits of "rural areas" in the state's banking system amounted to 24 billion yuan that same year.[90] Loans to agricultural producers, however, have not kept pace with this increased share of deposits generated in that sector. Loans to state farms, communes, and brigades by banks in the state sector were 70 percent of "deposits in rural areas" while loans to communes and brigades and the enterprises they operated, and to individual peasants were 30 percent of the deposits in rural credit cooperatives (in 1980). A final means by which the state assists agriculture is in setting the prices at which machinery, fertilizers, and other agricultural producers' goods are sold by the state to the communes and peasants. The Third Plenum called for a 15 to 20 percent reduction in these prices over the next "two or three years." The difference between policy making and implementation, however, remains at question. Delegates to the Third Session of the Fifth National Peoples' Congress in 1980 openly complained that these price reductions had not been carried out.

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[88] Wu Zhenkun, "On Several Controversial Questions in the Discussion on Socialist Production Goals," Gongren Ribao (19 November 1980), p. 8. The relevant quotes from Stalin are, "the fundamental property of socialist production is to satisfy people's consumption needs. . . . Production divorced from the satisfaction of social needs will decline and become extinct."

[89] The revised budget for 1981 includes budget cuts in most expenditure categories when compared with the planned budget in order to cope with the problem of inflation. Thus agricultural investment will be cut, but it is difficult to determine what will happen to its relative share of the total.

cooperatives are organizationally under the direction of the Agricultural Bank of China.

[90] "China's 1980 Monetary Statistics," Beijing Review, No. 29 (1981). Rural credit
Unfortunately, it is not possible to tell how much of the "deposits in rural areas" of 24 billion yuan in the state's banking system refers to the deposits of communes, brigades, and peasants in rural credit cooperatives which are redeposited in the Agricultural Bank of China.

Nonetheless, the post-Mao leadership explicitly argues that the traditional Stalinist investment priorities ignored the basic requirements for China's modernization and that their adoption in the past had led to serious imbalances in the economy. Thus those priorities have been changed so as to ameliorate the previous neglect of agriculture. This change in priorities is responsible, at least in part, for the higher growth rate in the gross value of agricultural production compared to the rate of growth in industrial production in 1979. While grain output fell by 5 percent in 1980, due largely to drought conditions in North China, the output of cash crops registered 10 to 20 percent increases. The overall rate of growth in the gross value of agricultural production (3.3 percent), however, again remained higher than that for heavy industry (1.6 percent). Yet even with its higher priority, agricultural development remains largely a matter for the collective sector and peasant households. The material incentives, price policy, investment and credit availability of the post-Mao economy continue to favor the urban-industrial sector.

It is, in fact, changes in the total level of investment and its allocation within the urban-industrial sector which have demonstrated the post-Mao leadership's rejection of the Stalinist model most dramatically. In the draft budget for 1979 state investment in the light industrial sector was only increased from 5.4 to 5.8 percent of the total investment expenditures in the state's budget.[91] In the final accounting, however, the actual share was 6.4 percent in 1979 and this increased to 9.1 percent in 1980. The overwhelming share of industrial investment still goes to heavy industry, but this was said to be necessary to "ensure the proper allocation of funds to such key industries as the fuel and power industries." Furthermore, light industries were to be given priority in the allocation of funds for "tapping the potential of enterprises;" i.e., modernizing them. In 1979, the allocation of funds for "tapping their potential" were approximately 40 percent of the state's total capital construction investment in light industry. Increased shares of the state's investment in that year also went to the education and housing sectors. These revised priorities in the allocation of state investment also continued in 1980 and explain, in part, the rather dramatic shift in the structure of China's industrial sector and growth. Light industry grew by 9.6 percent in 1979 and by 17.4 percent in 1980, while heavy industrial production grew by 7.7 and 1.6

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[91] These and other statistics in the following paragraphs are from Zhang Jingfu, "Report on the Final State Accounts of 1978 and the Draft State Budget for 1979," FBIS (3 July 1979) ; Wang Bingqian, "Report on the Final State Accounts for 1979, and the Draft State Budget for 1980, and the Financial Estimates for 1981," Beijing Review, No. 38 (22 September 1980) ; Yao Yilin, "Report on the Readjustment of the 1981 National Economic Plan and State Revenue and Expenditure (Excerpts)," Beijing Review (16 March 1981) ; and "Communique on the Fulfillment of the 1980 National Economic Plan," FBIS (29 April 1981).

percent, respectively. Light industrial production is now greater than heavy industrial production for the first time in over a decade.

As a result of this restructuring of allocation priorities for investment and production, it is clear that the post-Mao leadership has rejected the "big push" strategies of the Stalinist model for those of balanced growth. Due to the serious economic imbalances inherited from the past, this new strategy of balanced growth should continue in the foreseeable future, or until these imbalances have been corrected. These new priorities also favor industries with more workers per unit of output and greater output per unit of capital and those which produce consumers' goods that soak up excess purchasing power, favorable features for stopping inflation, curing unemployment, and maximizing the rate of return on investment allocations. The defense and basic industries (metals and machine building) are now being asked to "step aside" while balance is restored to China's economic structure to ensure rapid economic growth. Their demands to "catch-up" through another cycle of "big push" or Stalinist growth should, however, gain greater weight as that economic balance is restored.

In the meantime, of course, it is the general population that has undoubtedly gained the most from the post-Mao leadership's rejection of the Stalinist model. It is claimed that the traditional Stalinist strategy created a mentality of obtaining increases in output simply by building more plants—that is, extensive growth. The post-Mao leadership now rejects that approach in favor of modernizing or "tapping the potential" of existing plants; intensive growth. As a result, not only has a greater share of state investment been devoted to the modernization of existing plants, the level of total investment is being cut as well. In theory this cut in the level of investment is an attempt to seek out the "ideal" rate of investment for long-run sustained growth. Specifically, this aims at the proper restructuring of the economy to ensure rates of accumulation and consumption consistent with balanced growth.

Western economists seek to determine this "ideal" rate of accumulation by means of mathematical growth models. Such models require the specification of target years for maximizing some objective or make it necessary for the researcher to specify a social rate of interest. The Chinese, however, have adopted a more empirical approach that draws on their own economic experiences. They note that present economic problems arose in the period after the First Five Year Plan, when the rate of accumulation rose to more than 30 percent. During the period of the First Five Year Plan itself, however, there were rapid increases in production, productivity, and consumption without budget deficits, unemployment and disequilibrium in the balance of payments. At that time, the rate of accumulation was about 25 percent. The Chinese thus conclude that the proper rate of accumulation must be 25 percent.

In the most immediate sense the practical reason for cutting the rate of accumulation and even the absolute level of investment are the imbalances that exist in industry. These include shortages of energy for operating new plants and of the construction materials

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for building them, the budget deficits and inflation, and the need to cut aggregate demand to the level of aggregate supply. Yet the post-Mao leadership's decision to cut the rate and level of investment has also resulted in some serious problems, as the next section of this paper will explain. At this point, some specific figures of the Chinese government's decision to cut investment will be presented to provide the background for the discussion that follows.

Between 1978 and 1980, the amount of capital construction investment in the state's budget allocations was reduced by about one-third. A sizable further reduction is planned for 1981. On the other hand, the decline in the rate of accumulation has been much slower. After rising from 32.3 percent in 1977 to 36.5 percent in 1978, it declined to 33.6 percent in 1979. The rate of accumulation for 1980 is not yet known, but it probably did not fall much below the rate in 1977—despite the sizable decline in capital construction investment allocation in the state's budget. Investment in state enterprises outside the state's budget and plan were approximately equal to those within it. Quite simply, the central planners and leadership were losing control over investment spending. This is a major reason why the State Planning Commission's control over all funds for capital construction is at the top of the list of fields targeted for centralization and unification at the present time.

This shift in priorities from defense and heavy industry to agriculture and light industry has, of course, led to a significant increase in the supply of consumers' goods and the standard of living. Yet, at the same time, the emphasis given material incentives by means of wage increases and bonuses for workers and the higher prices and tax concessions to peasants has resulted in even greater increases in per capita disposable income. Based on sample survey data released over the past year in the Chinese press, I have estimated that the average per capita disposable income of the peasants increased by 47 percent between 1977 and 1980 (14.2 percent in 1978, 19.9 percent in 1979, and 6.1 percent in 1980). Disposible per capital income of the families of workers and staff members increased by 28 percent over the same period (7 percent in 1978, 9.5 percent in 1979, and 9.6 percent in 1980).[92] Thus the shortages of consumers' goods continues to be a serious problem and the distribution of increases in supply to meet demand (especially in the rural areas) is hampered by the poorly developed transportation and supply distribution system.

The priorities now favoring the production of consumers' goods and the greater share of national income being devoted to consumption will undoubtedly continue, especially while inflation, unemployment, and serious bottlenecks limiting the expansion of heavy industry remain. Yet, while the rejection of Stalinist "big push" strategies in favor of balanced growth may continue over the foreseeable future, the shift to lower rates of investment and higher rates of consumption may not. Once balance has been restored to the structure of production, the rate of growth is determined by the rate of investment; and there is a tremendous backlog of investment needs for transportation, urban development, housing, science, education, defense, etc. Thus the current emphasis on increasing the rate of consumption and the standard of living may only be a temporary or one-time shift aimed at alleviating neglect over the past decades. There is some hint of this in current discussions regarding how to solve the budget deficits and inflation problem. These discussions suggest that there should be no further price or wage increases given in the next few years.

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[92] Limits of space do not permit the presentation of my derivation of these estimates for a paper yet to be written for publication. It is important to note, however, they rely on statistics from sample surveys, national averages, and several simplifying assumptions. It is also important to note that, given the relatively low base of peasant incomes, the higher percentage growth in peasant versus industrial workers' incomes has led to a closing of the rural-urban income gap in a statistical sense (the ratio of urban to rural incomes has declined), but the absolute size of the gap has increased. In other words, as a result of the post-Mao leadership's reform package, including the higher prices paid by the state for agricultural products, average worker incomes have increased by a larger amount than have those for the peasants—by my estimates, almost twice as much.

In other words, the rejection of Maoist economic principles may well reflect a permanent change in China's economic development, but the rejection of the Stalinist "big push" strategy in favor of balanced growth may not continue once equilibrium among the sectors has been restored. The recent emphasis on consumerism, moreover, may be an even shorter or more temporary change. Whether or not the rejection of the Stalinist development strategy in favor of balanced growth and consumerism becomes a more permanent feature of China's economic development program depends, I believe, upon how successful the post-Mao leadership is in their attempt to modify the third major ingredient of the Chinese development model they inherited from the past: the Soviet model, or China's economic system.[93]

THE POST-MAO LEADERSHIP'S PROGRAM OF ECONOMIC POLICIES: REFORM OF THE SOVIET MODEL

The current leadership obviously represents the right-wing veterans of the two line struggle. The peak of their power, prior to the death of Mao, occurred at the Eighth Party Congress of 1956. The speeches given by both Bo Yibo and Chen Yun at that congress argued for reform of the economic system in the direction of a greater role for the market.[94] When they regained power after the death of Mao, these same individuals, and others, renewed their arguments for economic reform. This effort to implement reform of the economic system is concerned mainly with the non-agricultural sectors of the economy—those sectors directly administered and operated by the state's planning and economic administrative bureaucracy. Within these sectors, the major purpose of the reforms is to introduce more decentralized decision-making, in connection with a greater reliance on market forces in decision-making. This is aimed at reducing the tremendous inefficiencies which come from their very exclusive reliance on the highly centralized bureaucratic economic administration of the Soviet model.

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[93] The Soviet model or economic system was originally developed to enable planners to implement the Stalinist development strategy, giving them the ability to control allocation of resources, production, and the distribution of outputs and end products. This is why many authors identify the Stalinist strategy as part of the Soviet model. In theory, however, there is no reason why the planners could not pursue a different strategy; i.e., balanced growth and consumerism. There is, however, a very large body of literature which indicates that other economic systems are much more efficient for the purpose of achieving the objectives of balanced growth and consumerism.

[94] See "Speech by Bo Yibo, Chairman of the National Economic Commission," and "Speech by Comrade Chen Yun," in Eighth National Congress of the Communist Party of China, Vol. II, Speeches (Beijing: Foreign Languages Press, 1956).

Agricultural production, on the other hand, is carried out in the collective sector—the collectivization of agricultural production being a principle ingredient of the Soviet model. As part of the collective sector, the production team owns and determines how best to allocate its resources and income, subject to the taxes, cropping and quota delivery plans it is assigned by the state. Following the failure of the Great Leap Forward, the right-wing of the party gained control over economic policy and succeeded in having the Central Committee issue the "60 Articles" mentioned earlier. These articles specified their own model of China's collectivized agriculture: the team was to be the basic-level decision-making, production, accounting, and income distribution unit in agriculture. Higher level authorities both within the commune and at the local level were not to assign plans and quotas to the team without consultation and in consideration of its special circumstances, or requisition their resources or income without proper compensation.

These principles were, of course, commonly violated and ignored between the mid-1960s (i.e., the overthrow of the right-wing) and 1976 (the overthrow of the Gang of Four). When the right-wing regained power following the death of Mao, they were successful in reissuing a revised version of the "60 Articles" at the Third Plenum of the Central Committee (December 1978). These do not, of course, call for a change in the economic system in agriculture, but rather reaffirm the rights and responsibilities of each of the three levels of organization in China's collectivized sector (the commune, the brigade, and the production team) that the right-wing had advocated throughout the past quarter of a century in the two line struggle. In other words, this reform involves a rejection of the Maoist and Stalinist models, but not the Soviet one. Collectivized agriculture—as specified in the "60 Articles"—is now viewed as not only an essential ingredient of their modernization program, but as a fundamental law of socialism as well.

There are, however, two recent developments which would call for changes in the existing institutional organization of China's agricultural sector. These could be classified as changes in the economic system, although agricultural production would continue to be collectivized. The first, an argument presented in an article published in Jingji Guanli (Economic Management) in February 1981, probably represents views not widely shared among the post-Mao leadership.[95] I have not, in fact, seen these arguments repeated by other authors advocating economic reform in published form. Nonetheless, this author's arguments points out a fundamental problem that continues to obstruct the realization of the right-wing model of collectivized agriculture in China.

As originally created (in the mid-1950s) the elementary agricultural producers' cooperatives (the present-day production teams) were true collectives and not part of the state sector or directly administered by the state. As a result of leftist movements to reach a higher stage of socialism, the communes and production brigades were created above the production team as part of a three tier collective structure. Unfortunately, in this process, the commune level administration took over the duties of the township level of government, with cadre taking the role of government administrators who took the initiative in dividing up the plans and quotas from high level authorities and imposing them on the production teams. Whereas, the Great Leap Forward has now been criticized as a failure and a "leftist adventure," the three tier organization of the collective has not been abandoned. Nonetheless, it was the commune system which had served as the vehicle whereby leftist policies were imposed on the production teams. As long as this commune system remains, how can the production teams become the basic decision-making unit? Thus, not only do the commune administrators continue to act as the local representatives of the state in assigning quotas and plans, they also continue to establish operational guidelines and policy for the production teams. Without resources of their own (i.e., land and labor), the communes and brigades continue to build up their income producing assets by expropriating them from the teams. According to this author, over the past two decades, this process of exploitation has resulted in the diminution of the teams to a size where they are too small to be viable collective units of production on their own.

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[95] Lin Tian, "Inquiry Into the Question of the System of People's Communes," Jingji Guanli, No. 1 (15 February 1981), pp. 10–13.

In order to realize the principles spelled out in the "60 Articles," especially those involving making the production team the lowest administrative unit with the resources and incentives to achieve greater output and income, the author provides a simple solution. He suggests that the township be reinstituted as the lowest level of government and that cadre at this level take on the task of "negotiating" tax, production, and delivery quotas with the agricultural collectives that will be the true collectives. In order to assure this, communes and brigades will be done away with and their assets distributed to the production teams. The production teams, as the only unit in China's collectivized agricultural sector, would be the actual locus of decision-making, accounting, production, and income distribution.[96] In order to make them more economically viable, the size of the production teams would be adjusted upward to approximate their size in the mid-1950s. They would not, however, be large enough to be economically efficient with regard to the running of small-scale factories, agricultural machinery parks, irrigation projects, etc.; the traditional economic argument for having the commune and brigade level administrative units. Here, the author puts his trust in the wisdom of the peasants. Where the benefits of larger scale administration and coordination of activities exist, the production teams will voluntarily get together and pool their resources and share the benefits from specific projects. The production teams will be much more conscious of the costs and benefits of such projects than has been true of the communes and brigades, who simply requisitioned the team's resources and incomes for such purposes in the past.

The arguments of this single author have been presented here not because they are likely to be adopted by the new leadership in the near future, but because they clearly identify the contradiction between the present institutional organization and the goals of new economic reforms.[97] Although improbable as such arguments now seem, the post-Mao leadership's reevaluation of Mao, their search for truth from practice, and their urgent need to solve China's basic agricultural problem may eventually lead to a more serious discussion of these issues. Even if adopted, such institutional change would not be inconsistent with the basic principles of a Soviet model economic system. They would, however, considerably modify the particular characteristics of the Soviet model economic system from that inherited by them when they assumed power.

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[96] The state farms, of course, would continue to be part of the state sector.

Much more significant is the second recent development: the implementation of the contract responsibility system. As discussed earlier, given the problems with determining the quantity and quality of work done in the traditional "work-point" system, and consistent with the renewed importance given material incentives, the new leadership has not only allowed, but actively encouraged, the introduction of "contract" responsibility systems over the past year.[98] The form of these "contract" responsibility schemes takes has already been discussed in terms of the movement away from Maoist principles of normative incentives to the new leadership's material ones. A small group, household, or individual signs a contract with the production team in which they agree to deliver a fixed quantity of product, receiving land and/or inputs for that purpose. In return they are awarded a fixed quantity of work points upon delivery of that product and are allowed to keep and dispose of any surplus above the fixed contract amount.[99] This form of "contract responsibility," the most widespread of those presently adopted by the production teams, changes the manner in which tasks are assigned and income distributed, but it does not change the basic institutions of collectivized agriculture in China.

A more advanced form of "contract responsibility" that is being introduced in some areas at the present time, however, could well be considered a systemic change. It involves, in fact, the introduction of a new model of collectivized agriculture which differs considerably from the basic institution of the Soviet model. In this more advanced form of "contract responsibility" communes, brigades, and teams "farm out" taxes, production, and quota sales assignments to small groups of households or individual households. The latter become responsible for organizing and carrying out production to meet their share of these taxes and sales quotas, keeping any surplus produced or making up any deficit on their own. In this scheme, the small-household or individual becomes the basic unit of decision-making, production, accounting, and income distribution. Communes, brigades, and teams continue to exist as administrative units, maintain agricultural machinery parks, and organize projects beyond the capabilities of the small group or individual household.

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[97] "The administrative structure of three-level ownership based on the production team is too complicated. The commune and brigade have actually become two administrative structures divorced from production. Moreover, under this system there are contradictions between ownership rights and administrative rights. The contradictions manifest themselves as follows: Within the sphere of the production team, the means of production such as land and the labor force are owned and allocated by the production team, and production is arranged by the production team independently, with responsibility for its own profits and losses. But the commune and brigade cadres can issue orders without being held responsible for economic losses caused by the mistakes in their guidance. . . . Cadres at the commune level . . . are assigned by and have their salaries paid by the state, but they are in charge of the collective economy. Quite often they are only responsible to the state, that is, the higher level. So it is very easy for them to issue instructions blindly. During the implementation of the economic policy in the countryside, it has been proposed to respect the right of the production team to act on its own. But this problem cannot be fundamentally solved, if the system of "three-level ownership based on the production team" is not changed. Lin Tian, op. cit.

[98] The various types of "contract responsibility" systems actually were initiated by the collectives on their own and similar schemes had been practiced in the 1950s. Inasmuch as they proved to be both very popular and effective, however, the Central Committee gave its formal approval of these incentive schemes in 1980. This official action was listed by the Beijing Review (No. 1, 5 January 1981) as the sixth in a list of the Ten Major Events of 1980. Devised and implemented by the individual collectives, the variety of contract responsibility systems in operation throughout China in early 1981 was tremendous. Much of the following discussion in this paper draws heavily on the excellent, detailed summary of the systems being used as of the end of 1980 in Tang Tsou, Marc Blecher, and Mitch Meisner, "Policy Change at the National Summit and Institutional Transformation at the Local Level," op. cit., pp. 328-38. See (b) The evolving system of labor management and the adjustment in relations of production in rural China: "the system of responsibility in farm production").

[99] In some cases, those responsible do not get to keep the surplus or have to make up the deficits in production, but are awarded bonuses or assessed penalties in work points; the team receiving the total product produced.

As far as the approval of the post-Mao leadership regarding this is concerned, the creation of small groups or individual households as the basic unit in agriculture is to be limited to those areas where collectivization has not produced increased productivity; in less densely populated areas and hilly regions where the economies of scale have not been realized. These areas, with standards of living below the poverty level, are said to account for approximately 10 percent of the collectives in China. A line item in the budget for state subsidies for impoverished production teams is directed at these same areas. In an attempt to elevate the standard of living in those areas, the post-Mao leadership has widely publicized this "contract responsibility" system as a means for achieving this. It has also been their policy, however, to restrict the implementation of this system to those particular areas and concern has been expressed about its spread to other collectives in rural China.[100] It is difficult to judge the extent to which this advanced form of "contract responsibility" has spread beyond that 10 percent of the collectives that has been officially permitted to adopt it. Yet the concerns expressed by the new leadership for preventing its adoption in other collectives implicitly recognize both the popular support for it among a large segment of the peasants and the serious erosion of collectivized in favor of household farming it could potentially cause.[100a]

Despite such indications of possible grass roots support for systemic change in the future and the argument calling for the elimination of the commune and brigade that was published in an official publication of the Chinese Academy of Social Sciences, as well as the current introduction of the "contract responsibility" system, the post-Mao leadership has not pursued a program of reforms aimed at changing the basic system of collectivized agriculture. Rather, they judge that the new policies introduced to replace Maoist principles and Stalinist strategy in the agricultural sector to be sufficient and the results obtained from these changes in policy to be rather favorable.

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[100] See, for example, Yu Guoyao, "How to View the System of Fixing Production Responsibility in the Households," Hongqi, No. 20 (1980), pp. 12–15, 35.

[100a] A recent article by Renmin Ribao correspondents which argues strongly for giving the peasants themselves greater freedom in determining their own production and income distribution admits that the contract responsibility system (which essentially recreates the household as the basic decisionmaking unit in agriculture) was to be limited to backward, poverty-level communes. Nonetheless, the authors refer to a 1980 Central Committee document which states that in those communes with higher income levels where the team members desire to introduce this contract responsibility system, as long as the state and collectivized sectors dominate the economy (?), the cadre should not be afraid to introduce this system. Presumably this refers to the farming out of various sideline activities to the individual households, while the basic grain production of the team remains a collective endeavor. See An Gang, Song Cheng, and Huang Yuejun, "There Is Hope for the Vigorous Development of Agriculture in China—Commentary on the Controversy Over Safeguarding of Peasant's Interests," Renmin Ribao (9 July 1981), p. 2 (FBIS, 23 July 1981, p. K16).

Those post-Mao economic reforms that would change the Soviet model or economic system are concentrated rather in the non-agricultural sectors. Furthermore, the reforms suggested for implementation in these sectors are not only extensive and widely publicized, they also appear to have the support of the post-Mao leadership. Yet it is very important to remember that even at the Eighth Party Congress in 1956, the advocates of reforming the economic system did not have the unanimous backing of the right-wing of the party, and I would argue the same is true today.[101] One proponent of economic reform has summarized the division of opinion as follows:

> The way to reform China's economic system is still under study. Generally speaking, there are three lines of thinking:
>
> 1. The trouble with our structure is not too much but too little centralization by the state. *Although such a view has not appeared in print,* it is supported by many more people than one might expect. (Italics added).
>
> 2. The trouble is indeed over-centralization, but mainly over-centralization by the central authorities. More independence should be granted to the provincial or municipal authorities. This view is supported by many.
>
> 3. The main trouble at present is lack of independence on the part of the enterprise. This dampens their initiative.[102]

This latter view dominates critical analyses of China's present economic system in published sources, especially those journals published by the Chinese Academy of Social Sciences. The point to be made is that much of the extensive discussion of economic reform in Chinese publications attempts to provide the ideological and economic justifications for reform of the economic system. Yet the actual reforms that have been introduced or implemented in practice on an experimental basis fall considerably short of these more academic arguments. Our purpose here is to analyze policies the post-Mao leadership has actually adopted and implemented, not the wealth of suggestions and proposals that have been made. The reforms that have been adopted and implemented in China's economy over the past few years had their origin in the attempt by Zhao Ziyang and other leaders in Sichuan, to determine how the "enthusiasm and initiative of the enterprises and workers" in that province could be "aroused" to achieve better economic results.[103]

This campaign in Sichuan began in the spring of 1978 and the resulting "experiments" were derived from comparisons between the performance of collectively owned enterprises not included in the state's economic plan and state enterprises that were. In addition, requests were made that managers of state enterprises suggest methods for reforming the system of management within the limits of the prescribed national economic system. These reforms were aimed at enabling them to perform as well or better than collectively owned (i.e., profit maximizing) enterprises. In October 1978, prior to the initiation of the national campaign to restructure the economy, experimental reforms were implemented at the Ningjiang Machine Tool Plant in Sichuan and subsequently adopted by 100 other enterprises in Sichuan, Yunnan, and Anhui Provinces. Given the reported success of these experiments, by the end of 1980, similar industrial reforms were adopted at some 6,000 enterprises throughout the country. While these 6,000 enterprises account for only 16 percent of the nation's state-owned enterprises, they are among the largest and more successful, accounting for 60 percent of the gross value of output and 70 percent of the profits for all state-owned enterprises.

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[101] In analyzing the reasons why their economic reform policies have encountered problems in acceptance and implementation, it is claimed that because their economic problems were more serious after the failure of the Great Leap, the right-wing program of economic reforms in the early 1960s had more unanimous support than is true at the present time.

[102] Jiang Yiwei, "The Theory of an Enterprise-Based Economy,' Social Sciences in China 1 (1980), pp. 53–54.

[103] This story concerning the origin of the economic reforms in China's industrial sector is that provided by the Chinese themselves. It is based on Tian Yun's "More Authority for Enterprises Revives the Economy." Beijing Review, No. 14 (6 April 1981). The description of the economic reforms which follows is drawn from this source.

As the above discussion shows, these experiments in economic reform were not part of a complete program of reform aimed at transforming China's economic system from one patterned on the Soviet model. Neither did they reflect the adoption of the "market socialist" model being proposed by "academic" theorists. Rather, these reforms were an attempt to "experiment" with modifications in the basic system of the centrally planned economy to make it more efficient. The experiments adopted include granting state owned enterprises the authority to:

1. Engage in production that lies outside the state plan. In other words, once the target for output assigned by the plan is filled, the enterprise can mobilize its resources to produce whatever is needed by the "market."

2. This above or outside plan production is to be offered to the state's supply system, which purchases it at administered prices set by the state. If, however, the state's "commercial and materials departments" do not purchase this output, the enterprise can sell it on the market.

3. As an incentive, the enterprise can retain a share of the resulting profit for its own use. This profit retention scheme takes various forms, but in most cases the enterprise has the right to retain a share of its "planned" profit after it has met its planned output target; 3.5 percent of the planned profits. They are allowed to retain a larger share of profits made from its above and/or outside plan production; 15–25 percent. A significantly smaller number of those enterprises participating in these experiments are allowed to retain a proportionate share of their total gross profits. This proportionate share is inversely related to the profit rates enjoyed in the relevant industrial sector. In another very small number of enterprises the enterprise retains all its net profits, after paying the state profit tax and industrial and commercial taxes (as was true in the past) and a tax on fixed assets (which is new). In other words, instead of turning over its profits as revenue in the state's budget, the enterprise now pays a fixed users charge for its capital assets and is responsible for its own costs, while being allowed to retain its profits. The retained profits generated by these various schemes are to be used to develop production, improve the workers' welfare (i.e., fringe benefits), and to pay bonuses.

4. In addition to these retained profits, funds at the disposal of the enterprise are further supplemented by increasing the share of depreciation funds retained by the enterprise from 40 to 60 percent.

5. As an incentive to use these retained profits "to develop production," the enterprise has the right to retain all profits earned for the first two years from any expansion or renovation of its production facilities (financed by these retained or self-provided funds). In a few specifically designated industries, such as the machine building and textile industries, funds for self-financed investment purposes can be obtained by loans from the banking system.

6. In order to promote exports, participating enterprises can apply for approval to directly engage in exports of their above and/or outside plan produc-

tion. As an incentive they are allowed to retain a share of their foreign exchange earnings to import "new technology, raw materials and other inputs, and key equipment" and machinery.

7. As an incentive for workers, participating enterprises may distribute bonuses out of their retained profits. These are not to exceed the limits set by the state; that is, not more than two months, wages a year in 1980.

8. Finally, participating enterprises are permitted to directly recruit and hire their own workers. They can enforce labor discipline by having the power to discharge any workers, including "party secretaries and factory directors," found responsible for "heavy losses to the state." While this reform means the enterprise is no longer forced to accept workers assigned to it by the state's labor bureaus (*in principle, at least*), the workers it does hire must obtain work permits from those bureaus. In other words, the enterprise must choose among job applicants sent to it by the labor bureaus. The enterprise can only exercise its right to fire workers for "the most serious offenses." Furthermore, they must have the approval of the trade union and workers' congresses (and, as always, the party), and this is given only in exceptional circumstances.

The justification for these "last resort" limitations, even though the purpose of this reform is to foster discipline, is that any worker fired from a state enterprise would find it impossible to find another job. Socialist countries do not have unemployment compensation programs.

Even though the preceding list of reforms are restricted to the 6,000 state owned enterprises and does not replace the basic system of centrally planned output and supply targets, they do represent a significant modification of the traditional Soviet model. There are, however, several factors which make this program less radical in nature than it might appear at first. Foremost among these is the failure of local cadre to faithfully implement them. These cadres are accused of being influenced by "feudal" beliefs; in practice this means they continue to follow the traditional Soviet administrative approach to the control and operation of the enterprise. They are criticized for carrying out the reforms only in a superficial manner while, in fact, continuing the practices of the past. Specific published complaints indicate that while some enterprises were entitled to receive a share of their profits or foreign exchange earnings for their own use, they were unable to obtain it from the local cadre or authorities. Other enterprises complain that they continue to be assigned workers by the labor bureaus. In an attempt to remedy this problem, speeches by the post-Mao leadership call for a campaign of political education to remove the "feudal" behavior and thinking of local party cadre and administrators.

Secondly, while the above list incorporates all eight basic features of the "experimental" reforms, this does not mean that all eight are being simultaneously introduced in each of the 6,000 enterprises taking part in the experiment. This is related both to the willingness and enthusiasm with which local authorities attempt to carry out the restructuring program, as well as specifications in the reforms themselves. As has already been mentioned, some reforms are limited to specific enterprises in certain industries, to be adopted only under certain circumstances, and within specific limits. For example, rather than providing unilateral grants in the state budget, the financing of investment from bank loans was limited to the machine building and textile industries and to the renovation or modernization of existing plants.

Finally, the terminology used in outlining these reforms does not always mean the same as might be commonly understood in the West. For example, the sale of above-target production on the "market" does not imply that these markets functions as "free markets" do in the West. In this sense, the only free markets permitted by the post-Mao leadership exist in the agricultural sector; the rural trade fairs or those markets that distribute the products generated by private sideline or cooperative activity. Even these markets are "controlled" by local authorities. "Markets" for the products of state enterprises is simply the terminology used to designate the transfer of products to other enterprises that takes place outside the state's supply allocation plan.[104] These goods must still be first offered for sale to the state's supply distribution system, and only then transferred to other enterprises through face-to-face negotiations. This transfer takes place at "negotiated" prices, but these must either be at the state's administered prices, or lower. Thus, although this outside of plan production enjoys a seller's market with excess demand, according to the ground rules set by the economic reforms, enterprises do not have the right to set higher prices for their products.

While profit sharing schemes have increased the retained funds available to participating enterprises, the higher percentages of profit sharing rates for above target production were designed to act as incentives to increase production. At the same time, by setting the profit share going to the enterprise on the basis of the profitability of the particular industry, the reforms still limit the total share of retainable profits to below 20 percent. For those few enterprises allowed to keep all their net profits, the users charge on capital and taxes collected by the state actually mean that these enterprises also retain less than 20 percent of their gross profits. Of the total profits earned by participating enterprises in 1980, 87 percent was turned over to the state, 10 percent was retained by the enterprise, and 3 percent was used to repay state loans or devoted to subsidies.[105]

Even given the fact these reforms were limited to 6,000 enterprises, were constrained by failures in implementation and restrictions placed on the rights actually given to the participating enterprises, these reforms do introduce changes that considerably modify China's Soviet model economic system in the industrial sector. In addition, although not precluded by the traditional Soviet model, two nation-wide changes have taken place which significantly modify the model as it has been implemented in China in the past and in many other socialist countries today. These are: the increase in the share of budget revenue retained by local authorities and the closing down of unprofitable enterprises.

Revenue sharing by budget units at various levels of the government has always been practiced within the context of the state's unified budget system. In the past, however, the share retained by local units was tailored to coincide with its expenditures; i.e., those expenditures approved by central authorities.[106] The post-Mao leadership's desire to rely on material incentives and the decentralization of some of its decision making power was aimed at mobilizing the initiative of local level authorities. Thus, they have not only significantly increased the rates of revenue shared by the lower level units but, even more important, given those units the authority to determine how that retained revenue is spent. In addition, local authorities have also been given greater authority to adjust the tax rates they impose. Thus, the significantly greater freedom given local levels of government in determining the use of these funds signals a meaningful degree of decentralization in the fiscal system; albeit within China's version of the Soviet model.[107] As a result, while the planned budget for 1981 shows an overall balance of revenues and expenditures for the unified national budget, the central government anticipates a deficit of 8 billion yuan. However, "quite a number of local governments will have financial surpluses." [108]

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[104] There is an exception to this general assertion: that is, the market that has been created for producers' goods. In their reinterpretation of Marxist economic laws of socialism the Chinese now define producers' goods as "commodities" which, therefore, can be bought, sold, and owned by state enterprises. State-owned enterprises cannot only sell these producers' goods on the market, they can advertise to find buyers. These markets, however, are specifically restricted to those producers' goods which have been produced in the past and have accumulated in inventories: i.e., goods for which there is a buyers' and not a sellers' market. To facilitate sales of these goods the enterprise can offer price discounts. According to the ground-rules set out by the economic reforms, current production is not to be devoted to producing goods for this market.

[105] "China Grants 6,000 Enterprises Extended Power," Beijing Review, No. 14 (6 April 1981), p. 23.

The second of these changes involves the closing down of enterprises due to heavy financial losses, the inefficient consumption of scarce resources, and/or the production of poor quality products. Again, while this change does not conflict with the Soviet model in theory, it does represent a very significant modification of traditional practice. According to traditional practices, once a socialist enterprise is created it receives subsidies for its losses, cannot break the "iron rice bowl" of its workers by firing them, and tries to meet its planned target as best it can. The thought of laying off workers or closing down an enterprise because it fails to make a profit or meet an efficiency test is simply alien to the thinking of a traditional socialist planner. Yet, in an attempt to balance the budget and reduce inflation, the post-Mao leadership has been forced to "bite-the-bullet" and close the most inefficient plants because they were using resources, especially energy, that were needed to keep more efficient plants in operation, and were creating a serious drain on the state's budget. Complete plant closedown is still used only as a last resort; the preferred solution is to incorporate them into specialized companies so as to take advantage of specialization and more efficient management. By the end of 1980, a total of 19,300 enterprises had been amalgamated into 1,900 specialized companies or general plants, but the number of state enterprises suffering losses still remained at 24 percent of the total.[109] Continuing discussion in the Chinese press concerning the need to protect and maintain equipment and for paying the wages and salaries of workers and staff in closed enterprises does indicate that the policy of plant shut-down is still being carried out. Furthermore, given China's present budget crisis, enterprises that continue to suffer losses have been assigned profit or loss targets. If they fail to meet those targets, they are to be faced with the cut-off of subsidies from the state.

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[106] See Nicholas R. Lardy, "Economic Growth and Distribution in China" (New York: Cambridge University Press, 1979).

[107] These revenue sharing rates vary among levels and units of government from less than 20 to over 70 percent. Yet it is very difficult to determine the share of retained revenue that is truly at the disposal of the local unit of government. As in the budget reforms in the 1950s, increases in the share of revenue retained can be accompanied by increased responsibility for expenditures stipulated by a higher level of government. For example, as the center of experiments in economic reform, Sichuan's share of retained revenue is very high, its contribution to the central government in 1979 is reported to have been only 80 million yuan. While this very high share for retained revenue is said to be due to the fact Sichuan was still recovering from the severe damage inflicted upon their economy by the Gang of Four, it is also related to Sichuan's being assigned responsibility for numerous investment projects, formerly the responsibility of the central government.

[108] Yao Yilin, "Report on the Readjustment of the 1981 National Economic Plan and State Revenue and Expenditure (Excerpts)." Beijing Review, No. 11 (16 March 1981), p. 18.

[109] "Restructuring of Industry," Beijing Review, No. 17 (27 April 1981), pp. 5–6. According to Zhang Jingfu's "Report on the Final State of Accounts of 1978 and the Draft State Budget for 1979" (FBIS, 3 July 1979), "at the end of 1978 . . . state enterprises running at a loss still accounted for 24 percent of the total." (p. L 15.)

If implemented and continued on a broad scale, these economic reforms in the industrial sector would result in the significant modification of the third, and final, element of the economic development model that China's current leadership inherited from the past. Yet, even as these reforms were introduced, they began to generate problems. This has led the post-Mao leadership to at least pause and rethink their plans to expand decentralized "market" activities aimed at modifying their basic, Soviet economic system. These problems involve not only "feudal" foot-dragging by local authorities and enterprise managers, but those who took advantage of the new opportunities to do just what the post-Mao leadership wanted them to do—maximize profits. Even though enterprises were supposed to offer above-quota production to the state's supply network at administered prices, many are reported to have behaved as if they were in a market economy, selling their products to enterprises that were willing to pay a higher price. Even though such sales were to be limited to inventories that had accumulated over time, once they were able to advertise and sell goods on a true market, some enterprises began to sell commodities from current production—again at higher than authorized prices. A few enterprises even began to take orders for commodities not yet produced.

In addition, while the reforms specified that retained profits could be used to distribute bonuses to workers on the basis of increased productivity, some enterprises handed out bonuses indiscriminately and for amounts larger than the state allowed. Some enterprises took advantage of their opportunity to gain foreign exchange through exporting their above-target production by diverting production from deliveries to domestic enterprises to foreign customers. This forced some scheduled domestic buyers to import these same commodities. Some enterprises also used their foreign exchange to import commodities that hardly qualify for "renovating or modernizing their production facilities;" i.e., automobiles and color television sets. One could easily add to this list of ways in which material self-interest, once it was permitted, took advantage of the reforms in ways not intended by the new leadership.

A more serious problem was the increased financial resources that these reforms placed at the disposal of local units of government and state owned enterprises. This was coupled to granting them the legal authority to use these funds for increasing either their production possibilities or welfare of their workers and staff. These revenue and profit sharing schemes not only reduced the potential revenue of the central government, but the increased prices paid to peasants and the higher wages and salaries for workers and staff reduced the potential profitability of the state's trading network and the state enterprises. The resulting budget deficits were financed by drafts on the bank and the issuance of new currency, adding to the current inflation. In an attempt to combat this inflation, the central government has tried to cut the rate of investment and stem the arbitrary catch-up increases in wages and bonuses. Yet, given the increased financial resources of the local units and their ability to use these resources as they choose, by increasing their out-of-plan investment and by awarding bonuses they have neutralized the central government's efforts in this area.

Even if this local spending were not inflationary, however, there would still be a major problem with these reforms: the difference between local interests and those of the central authorities. For example, a local unit desiring to make a profit might want to establish a particular enterprise, even if a similar one already exists in another unit; i.e., although the commodity may be available, they recognize that whoever owns the enterprise will get the profit. One pertinent example of this is the cigarette industry. When these reforms made it possible for them to do so, local units in tobacco growing areas built their own cigarette factories, diverting cigarette production and profits from existing enterprises that could produce higher quality cigarettes more efficiently. As a result, the central government lost revenue while the local units gained revenue, and idle capacity in the state's modern industrial sector went up while efficiency and productivity went down.

This same problem occurred in dealing with existing plants as well. If an enterprise in one administrative unit produced inputs for use in that of another administrative unit, any above plan output in the former could now be diverted to other buyers. Since it was free to produce for the market and negotiate directly with other enterprises, the enterprise would sell either to buyers within its own unit or those in any other administrative unit. This would make it necessary for enterprises that had received these inputs in the past to search for new suppliers. This, in fact, is the argument given for why China's best producer of television picture tubes in Beijing is currently having problems securing the necessary parts. For those enterprises now allowed to promote exports and to retain a share of the foreign exchange to import machinery and equipment to modernize their production facilities, many did so, with the result that China's import surplus not only increased but duplicate imports of machinery and equipment were negotiated by many enterprises. The list of such examples could be extended, but the results would all lead to the same conclusion: When central authorities decentralize decision-making power and control over money and resources to lower levels, the resulting decisions will serve local interests and objectives, not necessarily those of the central government.

A major problem with the Soviet model is that centralized determination of output targets for an industry results only in a generalized equation of supply and demand for a rather broad commodity category. It is not an equation of supply and demand that is item, time, and space specific. The breakdown of these national level aggregates into specific instructions to individual enterprises is done by means of a vertical hierarchy of administrative units. Thus, it is very unlikely that those instructions will represent a feasible and consistent set of targets for specific enterprises. In an attempt to cope with this problem, as well as unexpected developments which occur during the plan period, the enterprise must work through the vertical chain of command. It is unable to negotiate directly with other enterprises to solve its problems. Thus, a more efficient achievement of state plans necessitates a decentralization which gives the enterprise greater flexibility to negotiate directly with other enterprises. Yet, once some of the decision-making power over the allocation of resources is transferred from the direct control of the central authorities to those at lower levels, the latter are unable to make rational choices unless they base their decisions on rational prices; i.e., profit-maximizing alternatives. In order for the economic reforms to work in the manner that is intended, they must be accompanied by a price reform.

Although a few of China's advocates for economic reform have included the need for price reform in their arguments, there is little evidence that such a reform is planned in the foreseeable future. As a result, economic reforms aimed at granting greater material incentives, financial resources, and decision-making power to lower levels of government and state owned enterprises have been carried out in the context of an irrational price structure. This creates a tremendous variety of profit (and loss) rates for different economic activities. In other words, some enterprises would continue to be very profitable without any increase in efficiency while others would have to become terribly efficient to make any profit. For example, China's economy needs coal and grain; yet because of the "relatively" low price of these commodities set by the central authorities, both activities have very low profit rates. Rather than cope with this problem through the introduction of a price reform, it is argued that a complete set of differential profit and loss norms, taxes, and subsidies, etc., needs to be implemented. The history of decentralist economic reforms in Soviet economic systems tell us, of course, that attempts to solve the problem in this manner creates as many new problems as the old ones it solves.

No matter, for as has been mentioned earlier, current economic problems and experience in economic reform have led the post-Mao leadership to reconsider their evolving economic development model and strategy. Realizing the magnitude of the economic imbalances that lie at the heart of these problems, they now assign greatest priority to economic readjustment. This readjustment involves balancing supply and demand within and among all sectors of the economy, balancing the budget and the balance of payments, and achieving the proper ratio between investment and consumption. This macro-level economic adjustment cannot be accomplished by individual units of government and units of production in the state or collective sector at the local level. The economic reforms which provide greater decision-making power and control over resource allocations to those units may even work against the objectives of readjustment. Furthermore, these economic reforms cannot be expected to achieve their desired results until after the objectives of readjustment have been achieved; i.e., until balance has been restored to the economy. Thus, the leadership has decided that these experiments in economic restructuring are not to be expanded until that balance is achieved. There is to be a "consolidation" of their experiences with reform experiments already carried out. When used in this context, "consolidation" usually means retrenchment by the Chinese communists.

According to the post-Mao leadership, the only way to achieve balance in the economy is by means of central control. This is to be done over the foreseeable future by a program of "centralization and unification" in eight fields. Local units are instructed to carry out "the policies and measures" adopted by the central government. The State Planning Commission will have unified control and management over all construction and investment at the local level. There is also to be unified central control over all local financial and taxation systems. Central control is to be exercised over credit and cash management. State plans for production and supply allocation must be carried out as "prescribed by the state." Price control regulations are to be developed and unauthorized price changes are to be "resolutely curbed." In addition, wages, bonuses, and fringe benefits stipulated by the state are to be rigidly adhered to and a strict system of examination and supervision be enforced to make sure this is done. All foreign trade and foreign exchange are to be placed under unified management; i.e., central control. Finally, in order to help cover the planned budget deficit of the central government in 1981 and to reduce the funds at the disposal of local levels, 4 to 5 billion yuan of treasury bonds are to be allocated for sale to those state enterprises and local governments that have accumulated surpluses.

Unlike economic reforms introduced to replace the Maoist principles and Stalinist strategy, those implemented to modify the economic system are not part of an attempt to replace the basic principles of a Soviet model. Certain types of contract responsibility systems introduced to create a more effective incentive system are not intended to replace the basic institutions of China's collectivized agriculture. In industry, a great many economic reforms have been experimented with that would, if taken as a whole, be more consistent with a market-socialist economy than a Soviet model economy. Yet, rather than displacing the Soviet model, these reforms seek to supplement it. The economic problems associated with the basic Soviet model, however, are well known throughout the Western, non-socialist world and these same problems have also now been publicly discussed in China. In addition, many reforms presently being introduced which supplement and modify that basic model to make it work more efficiently could well lead to changes that would ultimately transform China's Soviet model economy into one more like those now called market socialist economies. The possible future consequences and destiny of the post-Mao leadership's program of economic reform are discussed in the concluding section of this paper.

FUTURE PROSPECTS

This essay has analyzed the post-Mao leadership's economic development model in terms of its explicit rejection of Maoist principles and Stalinist strategy accompanied by economic reform aimed at modifying their Soviet-type economic system. Despite the wide range and variety of economic policy changes that attempt included, that discussion does not represent a complete catalogue of economic policy changes the post-Mao leadership has introduced over the past few years. Nor have the specific details of those changes been presented. A complete and detailed analysis of the ongoing flood of post-Mao economic policy would require a book length study. In fact, at the present time, a more complete and detailed analysis would be premature. This new program of economic reform is still unfolding with novel and unexpected changes occurring with every passing month. In short, we are still in the midst of a transition period which began with the death of Mao and overthrow of the Gang of Four in 1976. By the fall of 1981, the right-wing of the party, under the leadership of Deng Xiaoping, had consolidated its hold over top level positions of power in the party, but they are still searching for a well-defined set of principles, strategy, and economic system for achieving the economic modernization of China.

Our analysis argues that the post-Mao economic program represents an evolutionary process which began with their rejection of Maoist principles which they had objected to since the 1950s; principles which had obviously proved economically counterproductive during the last two decades. The post-Mao leadership soon came to realize, however, that the Stalinist strategy which they themselves had advocated in the past had also created serious inefficiencies and bottlenecks in the economy. This realization led them to adopt the strategy of balanced growth. Finally, using the new guidelines of "seeking truth from practice" which allowed for open and frank discussion of the well-known inefficiencies of a Soviet-type economic system, the post-Mao leadership began to experiment with reforms aimed at modifying their basic economic system; not, however, to dismantle it. This reform program builds upon right-wing proposals of the 1950s, but goes beyond those earlier proposals in a comprehensive attempt to discover and adopt a blend of capitalism, market socialism, and a Soviet type economy that will fulfill their dual objectives of economic modernization and the transition to a higher stage of socialism.

Within this general framework, the discussion here concentrated on an analysis of the particular economic policies and reforms introduced by the new leadership over the past few years. In this discussion, the various obstacles each reform encountered and/or economic problems their implementation created were pointed out in order to indicate clearly the difficulties the post-Mao leadership has had in that effort. These difficulties not only help explain some of the economic problems they currently face (as is pointed out by various contributors to this volume), and why the evolution of that economic program has undergone various changes and is currently being "consolidated," but help explain why it is very difficult to predict the eventual outcome with any certainty. At the same time, however, our emphasis on those problems should not be taken to imply that program has failed; nor—more relevant—that the post-Mao leadership has given up in their search for that blend of capitalism, market socialism, and a Soviet type economy that will achieve their objectives of a modernized, socialist economy.

Many of the problems encountered in their program of economic reform can be explained by the very serious nature of the many problems they inherited when they came to power. In addition, many of these problems replicate the experiences of other Soviet type economic systems in their attempts to adopt similar policies and reforms to achieve the same objectives. Finally, although we have concentrated on the problems associated with the new leadership's program of economic policies and reforms, as other papers in this volume show, there are a great many economic benefits from this program. Compared to the situation in the past, standards of living have increased rapidly, the economy is being rebalanced, and the private sector is flourishing. A fundamental change for the better is the leadership's readiness to admit and discuss their economic problems, to release quantitative data to illustrate their magnitude, and to seek truth from practice in solving those problems. Finally, while it is very difficult for a Western observer to judge, there obviously is considerable popular support for the post-Mao leadership's program of economic policies and reform. As in any Western democracy, there are many who complain. The real question, however, is how many would want to go back to the economic policies and system that existed before the death of Mao?

Obviously, as a Western observer from Ann Arbor, I cannot answer that question. Yet, as a student of China's economy over the past two decades, I do have a subjective opinion as to the fate of the post-Mao leadership's program of economic policies and reform in the future. Any assessment of the possible future evolution of the post-Mao economic reforms depends significantly on an assessment of the political future of the right-wing, post-Mao leadership itself. This latter, in fact, is the subject of Robert G. Sutter's paper in this volume, "The Political Context of the Four Modernizations." Inasmuch as his arguments and conclusion are complementary and consistent with my own, I can refer the reader to his paper and merely present my subjective or intuitive projections for the post-Mao leadership's program of economic policies and reform below.

With the complete rejection of Maoist principles, the pendulum has now swung to the extreme right. Although history has taught us to anticipate a future swing back to the left, I do not believe this will happen. There are a number of reasons which support this. First, the Chinese have experienced the negative impact of Maoist principles on China's economic development. The new leadership has devoted considerable effort to a reinterpretation of Marxism to show that Maoist principles are an unorthodox interpretation of Marxism. Mao himself is dead, and while considerable effort has been made to retain his symbolic role in history, much of his work over the past two decades of his life has been discredited. Yet, I do expect the pendulum to move back to a more moderate compromise with some Maoist principles.

The new emphasis on material incentives, dependence on the import of foreign technology, specialization and a greater division of labor internally, exposing enterprises to the tests of efficiency and profitability will continue, but within greater limits. We can already see some of this moderation and the creation of limits being introduced in the economic policies of the right-wing. Quite simply, as operational programs, Maoist economic policies were an economic disaster. However, as general principles, they have considerable appeal not only among the population, but among party cadre as well. As the economic consequences of the post-Mao leadership's economic development model and strategy become evident; such as a more inequitable distribution of income, greater dependence on foreigners, and increased unemployment, support for Maoist principles can be expected to increase. As a result, I believe the post-Mao leadership will be persuaded to moderate somewhat their outright rejection of Maoist principles. I do, however, expect the pendulum to remain right of center for some time to come.

The rejection of Stalinist "big push" development strategy in favor of giving higher priority to China's problem bottleneck sectors (such as energy, transportation, light industry, agriculture, urban social overhead capital) is dictated by economic necessity. I also expect that this feature of the post-Mao economic model will last over the foreseeable future, or at least until the economy regains the path of balanced and sustained economic growth. In 1979, the post-Mao leadership thought this would take three years. The following year, they extended their forecast another two years. Now they speak of "five years or more" or of "two five-year plans." I expect that the "readjustment" or "rebalancing" of China's economy will continue to be the major concern of China's leadership for the rest of this decade. Once this rebalancing and path of self-sustained growth is obtained, however, the pent-up demands—assuming the post-Mao leadership is able to keep them pent up that long—of traditional "big push" interest groups such as heavy industry and defense, will be arguing for high rates of investment and growth.

In my opinion, such interest groups will create a serious political problem for the post-Mao leadership long before the end of this decade. As current short-run economic problems begin to be solved, China's current leadership will find it difficult to contain the pressures these groups are sure to assert. In addition, I believe that the change in priorities in favor of consumerism, at least to the extent it has been carried out in the past year, will be a short-run temporary phase. Again, the current priority given to consumers' goods is dictated by economic necessity. After three decades of strenuous effort for the sake of national economic growth, the Chinese population obviously demanded and deserved a significant increase in their standard of living. On the average, their standard of living has improved over the past two or three years. Once this catch up redistribution of resources has been achieved, however, and as economic conditions improve, further increases in the well-being of consumers will probably be constrained for the sake of further growth in the development of bottleneck sectors and to meet the demands of the special interest groups referred to in the previous paragraph. As in the case of current policies which negate Maoist principles, I do not believe the balanced growth strategy of the post-Mao leadership will soon give way to yet another period of Stalinist "big push" development campaigns. Rather, the rate of investment and the allocation of that investment will be successfully adjusted in favor of a much greater compromise between those two basically different strategies than is true at the present time.

I am more pessimistic about the fate of the economic reform program itself. While economic necessity has mandated its implementation, the principle advocates of these reforms lack a broad power base within China's political system. Furthermore, the history of economic reform exposes the extent to which these reforms represent a tug-of-war over economic and political power between central and local authorities. I simply have my doubts about whether local interests can win this tug-of-war in China. Nonetheless, the post-Mao leadership argues that the reassertion of centralization and unification at the present time is necessary to achieve readjustment, but once readjustment is achieved the economic reform program will not only be feasible, it will be carried out. It is true that these economic reforms will work better once the ecoonmy is balanced. Nonetheless, even in a balanced economy, economic reforms which transfer real decision making power to the lower levels require the adoption of a system of rational prices. In other words, the basic problems or contradictions of economic reform in a Soviet type economic system will remain. Whereas compromises between Maoist and right wing economic principles and balanced growth and big push strategies can be expected to evolve over the decade of the 1980's the compromises implicit in a mixed economic system which incorporates major features of both decentralized, market socialism and a centralized, planned economy have proven to be very unstable. Nonetheless, the need for and seeds of economic reform have been acknowledged and created.

At the present time there are ample reasons for believing the Chinese will retain the basic features of the traditional Soviet economic model.[110] However, over the foreseeable future, it is far from certain that the campaign to reform China's Soviet type economic system—initiated in the mid-1950s, renewed in the early 1960s, and vigorously pursued after the death of Mao—will not succeed. It can be argued with some certainty, however, that the new Chinese economic development model of the 1980s—one that rejects giving operational priority to the Maoist economic principles, adopts a rate and allocation of investment that is a compromise between the Stalinist "big push" and the "balanced growth" strategies, and to a lesser or greater extent allows for decentralized decisions based on market forces to supplement central control and planning in the allocation of resources and products—will be a considerable improvement over the Chinese model of the past in the post-Mao leadership's search for the path of sustained growth and ultimate modernization of the Chinese economy.[111]

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[110] It is interesting to note that Milton Friedman, Nobel prize-winning economist, after a very brief trip to China, came to conclusions concerning the possible fate of the economic reform program similar to my own. He said: "On an absolute level, China is a very poor, backward economy. The great bulk of its enormous population is engaged in agriculture . . . and the level of productivity in industry is terribly low. . . . With respect to change, as opposed to level, the situation is more complex. There clearly has been a decided improvement in the economy over the past three years or so. The Chinese attribute this to the new "pragmatic" policies adopted under Vice-Premier Deng, who is clearly the person in charge. My own impression is somewhat different. It is a common observation that the restoration of order in a society that has been in a state or turmoil is capable of producing a rapid improvement in the economy. . . . The mere restoration of order on the death of Mao and the gaining of power by Deng was bound to permit a rapid recovery and a jump in economic level. I believe that is a far more fundamental explanation than the Deng reforms, most of which are so far only on paper. The reforms—the attempt to introduce market elements, the opening up of contacts with the West, and the encouragement of foreign investment, and so on—are in a desirable direction. But the test of whether they will be carried out and what their effects will be is still for the future. . . . My own conjecture is that there will be considerable progress in the next few years as some of the newly announced policies work themselves through the system. At the same time, I am pessimistic that the progress will be long continued. Opening up the system involves dispersing power and responsibility and that will produce threats to the security of the centralized political apparatus. It is likely to respond by closing down again." (Milton Friedman, "Report to the Committee on Scholarly Communication with the People's Republic of China on Trip to China," mimeo). Milton Friedman visited China in the fall of 1980.

[111] It is important to note that the adoption of an improved Chinese economic development mode lby the post-Mao leadership is only a necessary condition, not a sufficient condition, for solving both the current short-run economic problems they face—budget deficits, inflation, unemployment, import surpluses, etc.—and the fundamental long-run obstacle [illegible] the modernization of China's economy—the problems of agriculture, population, technology, etc. The assessment o fthe present status of these problems and the possible headway the post-Mao leadership will make in trying to solve them in the decade of the 1980s is presented in the many papers which follow in this volume.

THE POLITICAL CONTEXT OF THE FOUR MODERNIZATIONS

By Robert G. Sutter*

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SUMMARY[1]

Recent Western scholarship and authoritative Chinese comment have shown that Chinese politics and China's political system have seriously hampered China's recent economic development efforts. Some Chinese leaders have been particularly outspoken in arguing that sweeping political reforms are a prerequisite for an effective pursuit of the four modernizations.

The reforms include changes in Chinese laws, institutions and administrative practices, but at their heart are major leadership changes. Following the death of Mao and the arrest of the "gang of four" in late 1976, Chinese leaders inherited a massive administrative structure staffed by cadre seriously divided along ideological, generational, institutional and factional lines. Reformers[1a] like Chinese Communist Party (CCP) Vice Chairman Deng Xiaoping recognized that Chinese decision making on economic development and other programs would continue to be disrupted by such divisions unless they managed to establish a more unified and competent leading group at the top levels of the party, government and army. Such leaders, in turn, would be positioned to rally the support of frequently hesitant and indecisive cadres at lower levels in the Chinese administration, and to win the backing of the Chinese people for their modernization programs. Without a more unified leadership, strong differences among senior leaders would cause indecisiveness and vacillation over modernization policies and other programs. Officials at lower levels would be inclined to hedge their bets in this uncertain atmosphere, and would avoid the full commitment needed to carry out modernization programs effectively.

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[1] I would like to thank Richard Bush, Carl Hamrin, H. Lyman Miller and Larry Niksch for their helpful comments on earlier versions of this article. James Huskey provided very valuable research assistance and numerous insights.

[1a] It is important to emphasize at the outset that the term "reformers" is used in this article as a matter of convenience to refer to those Chinese leaders interested in major *political* changes in China. Of course, inasmuch as political considerations have long had a profound impact on economic policy and development in China, this group clearly overlaps with another distinct group of officials—those who advocate specific reforms in China's *economic* system. This latter group is frequently referred to as "reformers" in other articles in the volume.

Chinese reformers have achieved considerable success in altering Chinese laws, institutions and practices and in removing political opponents. However, they remain far from achieving their goals. The record of the past few years shows that Chinese leaders remain divided over how far they should go in reducing the influence of Maoist policies of the past and in removing officials closely associated with those policies. They debate over the need for decentralizing economic decision making, as opposed to strong administrative control for economic developments. Other issues include how much administrative control should be exerted over public opinion and the work of intellectuals and scientists, what role capitalist countries should play in the development of China's economy, and how closely China should align with the countries of the West in opposition to the U.S.S.R.

Prospects for solving these kinds of leadership differences appear uncertain. Future political reform and leadership unity will be complicated by divisions left over from the past, differences over the impact of strong reforms on Chinese political stability, and persisting institutional, generational and factional divisions. Reformers will also find it difficult to make headway when conducting leadership rectification (i.e., purges) through party channels influenced in many cases by officials who oppose reform. Their efforts will also be undercut by contradictions and tradeoffs seen in many reform measures; these cause side effects that have a negative impact on important Chinese interests and prompt calls for a halt or slow down in reform.

A cautiously optimistic scenario for the next few years holds that Chinese reformers will continue to make slow and halting progress toward the establishment of a more unified, pragmatic and technically competent leadership that will gradually develop a more coherent modernization program capable of eliciting more active support from Chinese officials and people. Opposition to reform programs will persist, but will probably remain diffused, as in the past. Opponents will probably be unable to offer a competent alternative strategy to the recent modernization efforts. This scenario does not hold out great opportunities for large increases in U.S. economic investment in China, although bilateral trade may continue to grow. But it seems to serve American interests in promising a continuation of close Sino-American cooperation in fostering a mutually beneficial balance of power in Asian and world affairs, barring a major flareup over such sensitive bilateral issues as Taiwan.

I. INTRODUCTION

Chinese politics have long had a major impact on China's approach to modernization and economic development. Major economic decisions have been made by officials in the administrative structure of the Chinese government, party and army, who in turn have been dominated by leaders of the Chinese Communist Party. In the past, Chinese communist political organization and ideology were widely seen as instrumental in forging strong national cohesion and economic progress in China. They were viewed as fundamentally important in transforming China from a state of demoralized disintegration earlier in the 20th century to a status among the top ranks of world power in recent years. Even critics of the many "human costs" of China's revolution—the strict restraints on individual freedom, the large-scale purges of Chinese leaders and intellectuals, and the mass campaigns directed against various sectors of Chinese society—were grudgingly impressed by the Chinese administration's ability to organize and mobilize the resources of the country in a drive to develop China's wealth and power.[1b]

In the early 1970s, a growing number of Americans—including many members of Congress—traveled to China for their first close look in over twenty years. While they differed in their overall impressions of China, they generally agreed that the Chinese political administration had proven to be an effective instrument in promoting conditions needed for material advancement and economic modernization.[2] A student of Asian affairs who spent considerable time in China as a young man, Senate Majority Leader Mike Mansfield was among the most outspoken in this regard, although similar sentiments were seen in a wide variety of scholarly and press reports about China at that time. Praising China's accomplishments following his visit there in 1972, he said:

> There has not been a major flood, pestilence or famine for many years. The cities are clean, orderly and safe; the shops well stocked with food, clothing and other consumer items; . . . The housing is of a subsistence type, but is now sufficient to end the spectacle of millions of the homeless and dispossessed who, in the past, walked the tracks and roads or anchored their sampans in the rivers of China and lived out their lives in a space little larger than a rowboat.[3]

In a report on his visit in 1975, the Senator echoed these themes more emphatically. He said:

> The livelihood of the people seems to be improved from what it was at the time of my first visit to the People's Republic almost three years ago. In Peking, for example, a great deal of new housing was evident. The people appeared to be better clothed. More trucks and other commercial vehicles and more sophisticated bicycles were on the streets. Shops offered a greater variety of consumer goods.[4]

The Senator also offered a positive assessment of Chinese medical care and the Chinese education system. He noted in his report in 1975 that:

> After the establishment of the People's Republic of China in 1949, the new government was faced with a population plagued by malnutrition, communicable and parasitic diseases, and inadequate health facilities and personnel. Everywhere there were scurvy-ridden, lice-infested, potbellied children with inflamed

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[1b] Schurmann, F. H. Ideology and Organisation in Communist China. Berkeley, University of California Press, 1966, U.S. Congress, Senate Committee on Foreign Relations, Sino-American Relations: A New Turn. Washington, U.S. Govt. Print. Off., 1979, pp. 117–134. (Hereafter cited as Senate Foreign Relations Committee, Sino-American Relations: A New Turn.)

[2] Senate Foreign Relations Committee, Sino-American Relations: A New Turn, pp. 117–134.

[3] U.S. Congress. Senate. Journey to the New China. Washington, U.S. Govt. Print Off., 1972. p. 2.

[4] U.S. Congress. Senate. China: A Quarter Century After the Founding of the People's Republic. Washington, U.S. Govt. Print. Off, 1975, p. 3. (Hereafter cited as China: A Quarter Century.)

> eyes, and countless beggars. An open prostitution problem existed as did rampant venereal disease and tuberculosis . . . Now there has evolved a system which provides universal basic health care. It is a system which has eliminated veneral disease, controlled tuberculosis, partially controlled malaria and schistosomiasis, and made world-recognized achievements in burn therapy, re-implantation of amputated extremities and digits, and in the treatment of fractures. The system has given rebirth and new significance to traditional Chinese medicine in the usage of acupuncture.

He went on to note that:

> Education is free and compulsory for seven to nine years, varying in length from area to area. . . . Education in China is directed to practical application, not to learning for the sake of learning. Young children are taught to read and write and are generally prepared for limited specialized training. Work and other ethical values are also instilled in them in accordance with Maoist concepts. At the secondary level, education is usually combined with practical experience keyed to turning out persons capable of going directly to jobs in the communes and factories. Additional on-the-job training takes place later. Those destined to be skilled technicians, for instance, go through an apprenticeship of several years.[5]

More recent reporting by specialists and general visitors has reflected a change in Western attitudes concerning Chinese politics and modernization. While acknowledging the accomplishments of the past, many observers have become skeptical that the current Chinese political and administrative systems are well suited to foster future economic development and material progress. They have seen them more as impediments than as assets in this regard. Thus, for example, they have highlighted the negative impact of policies followed by Mao Zedong and his more radical followers during the decade of the Cultural Revolution, 1966–1976. They have noted such things as how the effects of leadership disruption and factionalism brought on by Maoist policies tended to paralyze the planning process and led to widespread work stoppages and disruptions in the transportation system which in turn had a negative effect on economic growth.[6]

Following the death of Mao and the arrest of the gang of four in late 1976, some analysts judged that negative effects of Maoist policies on the Chinese administrative system and modernization might last only a short while. They were encouraged by policy changes begun by more practical post-Mao leaders in Peking, judging that they could fairly quickly reorient Chinese policies in support of a pragmatic pursuit of economic progress.[7]

Other observers were less sanguine, however. They have seen the legacy of Maoist politics as a long term and deeply rooted impediment to the pursuit of the four modernizations. In particular, they have questioned the ability of China's new leaders—representing widely different backgrounds, interests and political points of view—to cooperate effectively, rally the support of the enormous Chinese party-government-military bureacracy, and mobilize the Chinese people in support of innovative but frequently untested economic programs.

Several have judged that a kind of "fifth" modernization, involving large scale political reform and major leadership changes, would be required in order for China to succeed in modernizing its agriculture, industry, science and technology and national defense. Typically, an influential CIA study, "China: The Continuing Search for a Modernization Strategy,"[8] stressed that China needed basic changes in its leadership organization and ideology in order to meet political requirements for effective economic development. The study warned that none of the needed changes would be easily achieved and added that "years of consistent and patient effort by the leadership and its successors will be required before these elements begin to reinforce, rather than hamper, Chinese economic growth."

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[5] China: A Quarter Century, pp. 4, 10.

[6] See article by Nicholas Lardy in U.S. Congress. Joint Economic Committee. Chinese Economy Post-Mao. Washington, U.S. Govt. Print. Off., 1978.

[7] Ibid.

Chinese commentaries also have frequently been frank in acknowledging that leadership differences continue to complicate Chinese decision making at all levels. They view the current condition of China's political system as an impediment to effective modernization. They advocate wide-ranging reforms that will help establish a more unified Chinese leadership that will be able to pursue a more coherent modernization strategy with the support of the Chinese people. They frequently recall the leadership rectification campaign in Yanan during the 1940s as a model for current reform. Through the Yanan campaign, Mao purged large numbers from a party organization bloated in previous years through looser recruitment criteria, a main target being cadre who were sympathetic to Wang Ming's "leftist deviationist" leadership and whose "dogmatic" adherence to the Comintern political line inhibited flexible adaptation of Marxist-Leninist principles to the contemporary Chinese situation. Similarly, the recent argument has been that the implementation of China's modernization program also requires drastic political changes, including leadership purges, reevaluation of the Maoist political line, reassessment of the party's past, and greater "democracy" and collectivity in the party leadership.

II. POLITICAL REFORMS, 1977–1981[8a]

Since the death of Mao and purge of the gang of four, advocates of political reform in China have made considerable headway against frequently powerful opposition. With the backing of such important Chinese leaders as CCP Vice Chairman Deng Xiaoping, who was rehabilitated in mid-1977, they have managed to launch a number of successful reform initiatives and have removed several opponents from positions of power. Their goals are far from being reached, however. Their initiatives have frequently been offset by entrenched opposition or have become mired in some of the negative side effects of reform measures. As a result, the Chinese leadership remains divided on a number of important policy issues and has found it difficult to achieve a lasting consensus on a coherent modernization program.

The first major push for strong leadership reform came in early 1978. Media comment on a campaign to rectify and modernize the

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[8] Central Intelligence Agency, China: The Continuing Search for a Modernization Strategy. A Research paper. ER 80-1-248. April 1980, 21 p.

[8a] This section benefited greatly from and relies heavily on the excellent analysis of the course of Chinese political reform done by the Analysis Group of the Foreign Broadcast Information Service (FBIS). Weekly reports on Chinese developments appear in the publication "Trends in Communist Media." In addition, several special reports have been issued, including most notably "Chinese Political Debate Since the December Third Plenum," Aug. 1, 1979, by Dr. H. Lyman Miller.

Chinese army showed that Chinese leaders disagreed over the extent to which the party and state apparatus should be cleansed of sympathizers of the gang of four. The intense Army rectification campaign, fueled by a series of Liberation Army Daily commentaries, was designed to lead to a more thorough purge of gang of four followers throughout the Chinese institutional structure. Opposition to such a course of action was apparent, however, in the erratic treatment of the Liberation Army Daily comment in People's Daily, and the failure of the official party newspaper to endorse the army campaign.

The army campaign attacked three kinds of cadre which it said continued to pose serious danger to China's future development:

> Persons who "follow the wind" by shaping their political convictions and principles to prevailing circumstances,
>
> Persons who "slip away" from responsibility for political error, and
>
> Persons who "create earthquakes" politically and hope to profit from the disorder.

The campaign marked a sharp turnabout from the previous Chinese line, seen at the 11th Congress of the CCP in mid 1977, which maintained that investigations and purges of the Chinese leadership since the arrest of the gang of four had been largely completed.[9]

CCP Chairman Hua Guofeng reaffirmed his opposition to further major leadership changes in an address at the 5th National People's Congress in February 1978. He reiterated the line that the rectification of official ranks since the arrest of the gang had "in the main been completed." [10] But other comments at the congress were insistent that more sweeping political changes were needed to smooth the way for effective Chinese modernization. Thus, the March 6 joint editorial marking the close of the congress said that "We can . . . take big strides on the road of the new Long March (toward modernization) only when we strip away the gang's "leftist" cloak, uncover their ultrarightist essence and clarify right and wrong with regard to theory and line." [11]

Renewed signs of debate over leadership issues were seen at the March 1978 national science conference. Deng Xiaoping advocated that China's scientific elite be freed from past political controls to pursue their professional work, while Hua Guofeng reaffirmed the continued importance of politics and Maoist egalitarian ideology, even in the scientific world.[12] At an army political conference in May, Hua and CCP Vice Chairman Ye Jianying advocated such mild political methods as ideological training based on Mao Zedong's military writings in order to rectify the army's workstyle, whereas Deng Xiaoping was less inclined to treat Mao's legacy with reverence and implied that an expanded purge of army officers was called for.[13]

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[9] Foreign Broadcast Information Service (FBIS). Trends in Communist Media. Supplement. Peking Leadership Dispute Over Purge of "Gang" Followers. February 24, 1978.

[10] New China News Agency, March 6, 1978. Transcribed in FBIS Daily Report. China March 7, 1978.

[11] FBIS Special Report on Communist Media. The Fifth Chinese National People's Congress. March 17, 1978. p. 4.

[12] Hua's speech is seen in FBIS Daily Report. China. March 27, 1978. Deng's speech is seen in the March 21. 1978 edition.

[13] FBIS. Special Report on Communist Media. Chinese Army Political Conference: Persistent Leadership Difference Amid Mounting Pressure For Wider Purge, June 16, 1978.

THE THIRD PLENUM, DECEMBER 1978

The Chinese Communist Party work conference and third plenary session of the party's 11th Central Committee was held in late 1978 and strengthened the power of Deng Xiaoping and other officials interested in broad rectification and reform of the Chinese leadership. New appointments to the Central Committee and its Politburo widened support for reformist policies in those bodies. The selection of Hu Yaobang—a close associate of Deng—as party secretary general and propaganda chief augmented his ability to implement these policies and enhanced the likelihood of their long-term survival.[14]

The plenum also endorsed efforts to transform the basic style and character of Chinese politics along lines favored by reformers. It dismantled the personality cult surrounding Mao and promoted intraparty democracy; it reduced the authority of Mao's legacy by suggesting the late chairman's fallibility and limitations; and its reasserted the ultimate authority of the party organization itself. As a result, the plenum fostered an atmosphere of leadership collectivity and cast off ideological bonds that had hobbled Chinese efforts to modernize. The moves also served to dilute the authority of Hua Guofeng, whose status as Mao's heir and arbiter of the Maoist ideological legacy was substantially diminished.

Although reformers won important gains at the plenum, the long deliberations required an accommodation with other leaders holding differing views, particularly those who had profited from the Cultural Revolution and its subsequent struggles. Thus, some high ranking leaders who had opposed political change lost their bases of political power but retained their seats on the party Politburo for the time being. More important, the plenum decided to shelve such potentially divisive issues as an assessment of the Cultural Revolution in the interest of getting on with the modernization drive.

Following the close of the plenum, there were renewed efforts to achieve political reforms and leadership changes that had been compromised at the plenum. The efforts included attempts to redefine the political line of the gang of four as "leftist" rather than "rightist," and to reopen assessment of controversial developments in the party's history, notably the Cultural Revolution. The aim was to promote a more thorough-going purge of cadre recruited and promoted during and since the Cultural Revolution who still remained committed or beholden to that period's Maoist ideology and policies. Press comment at the time portrayed the purge as an essential prerequisite to effective Chinese modernization and equated it with Mao's elimination of opposition to his policies during the Yanan rectification movement of the 1940s.[15]

The calls for reform ran up against resistance from strongly pro-Maoist opponents. And the reforms were blocked by more moderate leaders, perhaps including Chairman Hua and Vice Chairman Ye, who argued that the purge of pro-Maoist leaders remaining in the administration would harm the party's stability and unity, and would consequently hinder progress in China's modernization programs.[16]

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[14] FBIS. Analysis Report. Chinese Leadership Conference and CCP Plenum, Nov.-Dec. 1978. Ratification of the Modernization Program. February 1, 1979.

[15] FBIS. Analysis Report. Chinese Political Debate Since the December Third Plenum. August 1, 1979.

Events during mid-March to mid-April 1979 also caused the vigorous challenge mounted by the reformers to drop off sharply. Instead, more moderate views upholding compromises made at the third plenum were reaffirmed in renewed calls to maintain leadership "stability and unity." And Peking emphasized a new line stressing the importance of upholding the ideological orthodoxy seen in the "four principles"—allegiance to the socialist road, to CCP rule, to the dictatorship of the proletariat, and to Marxism-Leninism-Mao Zedong Thought. Commentary during this period indicated that a variety of practical difficulties facing China—including a strained international environment following China's punitive attack on Vietnam, the outbreak of social unrest and political dissidence in several Chinese cities, and a growing realization of serious imbalances in the economy—together with a resurgence of leftist criticism of reform policies—provided the impetus for the strong reaffirmation of the more orthodox views that reformers had been challenging.

Reformers soon revised their approach and by early May they began to stress that the policies and leadership changes they were advocating were consistent with the "four principles" and "stability and unity" in China. They subsequently renewed initiatives for a wider purge of their opponents in the administration.

THE FIFTH PLENUM, FEBRUARY 1980

A new milestone was reached at the fifth plenum of the 11th CCP Congress held in Peking in February 1980.[17] The plenum focused on reforming party leadership to facilitate modernization, and substantially changing central leadership institutions in order to insure longer term continuity and implementation of practical modernization policies. The plenum removed several high-level critics of reform policies, elevated to high positions younger leaders, many of whom were closely associated with Deng Xiaoping, and restored the party Secretariat to high status in the implementation of policy.

The plenum's decisions on the central leadership and organization appeared intended to inspire similar organizational streamlining at lower levels of the party. Other plenum actions—including its long awaited rehabilitation of the Cultural Revolution's primary target, former chief of state Liu Shaoqi—similarly lent impetus to party wide reform and rectification. The plenum's militant communique amounted to a call to political battle against persisting resistance to leadership reform and modernization policies.

Later that year, Hua Guofeng was reduced in status when he gave up his premiership to the governor of Sichuan, Zhao Ziyang, a prime advocate of economic and political reforms. Administrative and economic changes in line with Zhao's experience in Sichuan were further promoted throughout China. The long awaited trials of the gang of four began in Peking in November and tended to further discredit Hua Guofeng and leaders like him who had supported Maoist policies in the Cultural Revolution and were resisting sweeping political changes and practical economic reforms.[18]

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[16] Ibid.

[17] FBIS. Analysis Report. Chinese Party Plenum: Movement Toward Succession, Rectification. April 11, 1980.

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RECENT DEVELOPMENTS

At the turn of 1980–81, signs of apparent growing Chinese political dissidence such as direct challenges to the leadership of the CCP, the outbreak of disturbances in several cities, anti-party politicking, bombings, strikes, and school boycotts combined with major economic dislocations requiring new decisions to scale down Chinese economic reforms and to reassert administrative control over the economic readjustment begun in early 1979. Together, these developments stalled those in the Chinese leadership who were pressing for more political change. They also blocked, at least temporarily, the formal demotion of Chairman Hua.

Peking did not publicize any of the speeches made by top party leaders at a December 1980 work conference, but the usually reliable leftwing Hong Kong journal, Cheng Ming, on February 1 summarized the main points of speeches reportedly delivered by Deng, Zhao Ziyang, and CCP Vice Chairmen Chen Yun and Li Xiannian. The views Cheng Ming attributed to Chen Yun, relating almost entirely to economic matters, were reflected in authoritative Peking press comment on economic readjustment since early December 1980. The political views the journal ascribed to Deng set the pattern for authoritative Peking comment on the political situation in China since the turn of the year.[19]

Deng's speech underscored evident concern over political disorders and other challenges to party leadership seen in editorials published on January 17 and February 8 in the party newspaper People's Daily. The January editorial, entitled "Political Stability Is the Guarantee of Economic Readjustment," carried forward a line introduced in a December 5 editorial on political work. It cautioned that there are "many factors of instability" which, if not dealt with, could prevent successful economic readjustment, hamper the "four modernizations," and slow political reforms. The editorial identified factors making for instability at both ends of the political spectrum. On the one hand, it hinted that rightwing elements had pressed for drastic curtailment of the party's leading role; People's Daily lectured that leadership by the party is stipulated in the constitution, and "whoever wants to change it is on a very dangerous road." On the other hand, the editorial denounced remnant leftist elements in calling it "imperative" to strike firmly at unrepentant "rebels" who "still uphold the misdeeds of Lin Biao and the 'gang of four' and . . . indulge themselves in the 'four bigs' [criticizing party leaders] and beating and smashing and looting."[20]

The February 8 People's Daily editorial was entitled "Democratic Reform of the State Must Be Realized Step by Step Under Conditions of Stability and Unity." In the vein of the January editorial, it expressed concern over political instability and threats to party leadership and suggested that political reform, like economic readjustment, must be delayed while those problems persist. After reviewing in detail the reforms already begun since the third plenum, the editorial stated that democratization must "go through a process and cannot possibly be accomplished in one move"—reform is "a complex question" that calls for preparation, planning, and experimentation. It cautioned those pressing for rapid reform that stability and unity are "indispensible" prerequisites to "pushing forward democratization" of the state. "Turmoil," it said, "cannot promote democracy and is detrimental to the democratic reform of the state." [21]

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[18] See the text of the indictment in the trials, replayed in FBIS Daily Report, China. November 20, 1980.

[19] For background and analysis on this period, see FBIS. Analysis Report. Political Instability in China Slows Progress on Reforms. February 13, 1981.

[20] The January 17 editorial is seen in FBIS Daily Report. China. January 19, 1981.

Subsequent comment specifically addressed the issue of leadership reform. In late February, Peking media publicized a report made a few months earlier by the permanent secretary of the party's Discipline Inspection Commission.[22] The report showed that problems of indecisiveness and vacillation, caused by leadership differences, continued to complicate decision making at all levels of the Chinese administrative structure. Thus, for example, the secretary mentioned efforts by Deng Xiaoping to "streamline" the Chinese bureaucracy. He said that even though Deng's initiatives had been widely discussed for years, they "still cannot be implemented in many places" because of cadre footdragging or outright opposition. He added that decisions on such sensitive issues as the rehabilitation of officials discredited during the Cultural Revolution frequently still remain in abeyance because "no one will solve problems" and "no one will assume responsibility." He called such "irresponsibility" the root cause of the "bureaucratism" that has undermined the power and prestige of China's administration in recent years.

A People's Daily editorial on March 10 made clear that Deng and other reformers still did not have the power to conduct a sweeping purge of remaining leftists and other opponents in the leadership.[23] The editorial pointedly criticized cadre who had resisted reform policies pursued since the third plenum and characterized such resistance as a fundamental impediment to the four modernizations. It said:

> Since the 3d plenary session of the 11th party Central Committee, some comrades have failed to understand, even resented, the party's line, and this is the crux of the problem. Very obviously, if this problem is not solved, or not properly solved, it is impossible to correctly appraise the current situation or thoroughly understand the necessity of further economic readjustments and political stability and impossible to really uphold the four basic principles. As far as leading cadres are concerned, if they fail to thoroughly overhaul their thinking, set things right and rid themselves of the "left" things, once the climate is right, they will experience a relapse and again make the same mistakes.

The editorial went on to recall the Yanan rectification campaign as a model for ridding the current leadership of the "pernicious" influence of "leftist" deviation. It said: "It was only after overcoming the 'left' mistakes that the Chinese revolution became victorious. And only after we have seriously cleared up and corrected the 'left' mistakes will our four modernizations program embark on a path of sound development."

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[21] The February 8 editorial is seen in FBIS Daily Report, China, February 9, 1981.
[22] The report is seen in FBIS Daily Report, China, March 10, 1981.
[23] The editorial is seen in FBIS Daily Report, China, March 11, 1981.

However, instead of calling for demotions and dismissals of negligent or unsympathetic leaders, as advocated by reformers in the past, the editorial restricted itself to calling for a "study campaign" that would allow all comrades to clear up their thinking and to make self-criticisms in a "gentle" atmosphere of "sincere heart-to-heart" talks. It called on party members to unite even with officials who had made "serious mistakes" in the past. It added an implicit acknowledgement that the prevailing consensus among leaders in China would not tolerate the kind of major leadership changes favored by some reformers, noting that such changes would make it "very difficult to maintain and develop stability and unity" in China.

This slow, compromise approach to leadership reform was clearly in evidence after the convening of the long-delayed 6th plenary session of the 11th Central Committee, which was held in Peking on June 27–29, 1981. While Hua Guofeng was removed as party chairman, he retained a post as a party vice chairman. Reform-minded officials Hu Yaobang and Zhao Ziyang were appointed Party chairman and vice chairman, respectively—a major victory for Deng Xiaoping, who replaced Hua as Chairman of the CCP's Military Affairs Commission. However, officials who had been thought to resist Deng's efforts to purge party ranks and to condemn Maoist excesses of the past—notably CCP Vice Chairman Ye Jianying, retained their high party posts. They were presumably influential in determining the plenum's balanced assessment of Mao Zedong and the CCP history since 1949, in contrast to the harsh censure favored by other leaders including Deng and Hu.

ASSESSMENT

The record of the past few years shows that many political reforms helpful to the pursuit of the four modernizations have been initiated and successfully carried out. Thus, for example, the top level of the central party and government apparatus is a far different group today than it was at the time of the 11th CCP Congress in 1977. The so-called "whatever faction" of Maoist loyalists has been removed from power, while more pragmatic and technically competent managers have been appointed to direct day-to-day affairs. Even more moderate figures like Hua Guofeng have been discredited in their efforts to preserve Maoist ideological tenets in the face of the need for greater material progress and improvements in the life of the Chinese people. Provincial level officers have been changed, as many leaders removed during the Cultural Revolution have been returned to power. A variety of other past injustices have been redressed; and the rule of law in society and the use of more democratic practices within the Communist party have been established as goals of the new administration.

Maoist dogma, the cult of personality, disruptive mass political campaigns and other features of the Cultural Revolution have been discredited as Chinese leaders have firmly emphasized a new approach that "seeks truth from facts" and cites "practice as the sole criterion for truth." Excessive revolutionary fervor—a hallmark of the Maoist era—has been labeled as an impediment to Chinese development and the main cause of China's economic shortcomings over the past 20 years.

Intellectuals and scientific personnel have been freed from many of the idelogical shackles that prevented them from working to their full potential in the past. Science and technology have been viewed as key elements in the modernization process and their practitioners are basking in new prestige.

Economic development, rather than ideological purity, has been established as the main source of legitimacy of the Chinese administration. An underlying theme of Chinese domestic policy since the third plenum has been that economic productivity, consumer welfare and political stability are interrelated.[24] Many of the changes in economic policy since the plenum—use of material incentives for production, increases in income for workers and peasants, installing new systems of rewards and penalties for industrial managers and economic entities, and experimenting with new and more efficient forms of industrial organization—are aimed at productivity increases. In effect, the administration has made an unprecedented appeal to the self interest of the Chinese population.

Political stability enters into the relationship between consumer welfare and productivity because the leadership believes that its grasp on power and permanence of its policies pivots on demonstrating the benefits of the new policies for most of the Chinese population. In the absence of improvement in consumer welfare, productivity will remain low and the potential for political disruption, as well as the leadership's vulnerability to challenges from within the party, may increase.

In security policy and foreign affairs, the Chinese administration has chartered an unprecedented forthcoming approach to the capitalist world, notably the United States, as a fundamental ingredient in China's basic effort to foster a strong international united front against the U.S.S.R. Closer ties with the West give China the security it needs in order to focus on internal economic development while limiting Chinese military spending. They also provide China with access to technology and equipment needed to modernize its industrial infrastructure.

Despite these achievements, however, the record of reform is also full of shortcomings, half measures and reversals. Thus, while leaders at top levels agree on the need to reduce the influence of Maoist policies of the past, they differ strongly on how far they should go in this regard and how rigorously they should attempt to remove officials who were closely associated with radical policies of the past. They debate over the need for decentralized economic decision making, as opposed to strong administrative control of economic planning. Other issues include how much administrative control should be exerted on public opinion, the workings of supply and demand in the consumer market, and the freedom of intellectuals and scientists to pursue their work. In foreign affairs, Chinese leaders appear to hold different views on the wisdom of largescale foreign investment and other involvement in China. Some also call into question the compromises China was required to make in order to reach a modus vivendi with the West, notably China's compromise over Taiwan in agreeing to normalize diplomatic relations with the United States.

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[24] See the discussion in CIA. China: The Continuing Search for a Modernization Strategy.

The checkered record of political and economic reform has continued to generate confusion and uncertainty among cadre in China. Faced with rapidly changing and sometimes conflicting signals from the top, working-level cadre have been reluctant to commit themselves fully. They have sometimes reverted to a low posture and have tried to avoid individual responsibility—a practice which is widely reported as a major factor undermining many changes China has tried in support of the four modernizations. Some recent commentaries even have referred to a "crisis of confidence" in China—a growing belief on the part of many Chinese officials that the PRC system as it exists today is not capable of successfully achieving the four modernizations.[25] In short, the record shows that the Chinese administration still has far to go to establish a more unified leadership that will effectively mobilize the resources of the Chinese party, government and army to direct and rally the Chinese people toward a more efficient and coherent pursuit of the four modernizations.

III. CURRENT IMPEDIMENTS TO POLITICAL REFORM

Current political reform and closer leadership unity in China are hampered by leadership divisions left over from past political struggles, recent differences over the effect of strong reforms on Chinese stability, and persisting institutional, generational and factional divisions. Reformers also find it difficult to make headway when conducting leadership rectification through the current administrative structure staffed by cadre with divided loyalties and interests. Their efforts are also undercut by the absence of clear criteria justifying demotion or dismissal of officials, and by side-effects of some political and economic reform measures which negatively affect important Chinese interests and require a reversal or slow down in reform.

LEADERSHIP DIVISIONS

The Cultural Revolution fostered a wide cleavage between officials who rose to power by supporting or accommodating Maoist policies, and others who were purged and have only recently been restored to power. Today, members of the latter group appear to hold the initiative at top levels in the Chinese party and government, and they have managed to remove some Maoist sympathizers from the Politburo and elsewhere. However, they have difficulty implementing their policies at lower levels where many cadre were selected during the decade of the Cultural Revolution. These officials frequently feel threatened by the current pragmatic programs and have done what they could to resist them in private while acquiesing in public. Others have withdrawn from decision making and have avoided taking a firm stand on controversial reforms—a form of passive resistance which has undercut the new policies and programs.[25a]

Resistance also comes from leaders who fear that sweeping political reforms or largescale purges will prove too disruptive. They have argued that it is better for China to tolerate diversity among its leaders, and resulting inconsistencies in policy, than for China to be racked by highly divisive purges that could undermine the fragile facade of leadership stability that has existed since the arrest of the gang of four. These officials have been in the vanguard of those who have called for a "mild," "step-by-step" approach to political rectification and have opposed mass dismissals called for by some reformers.

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[25] See, Asian Wall Street Journal, December 27, 1980.

[25a] I am indebted to David Raddock for his insights on this point.

Strong differences also exist between officials in the central government who want to promote major political and economic change, and those at lower levels who want to preserve the status quo in particular geographic areas affected by change. In many cases, the differences boil down to a fundamental cleavage in China between technically competent specialists or "experts" and loyal party or government cadre or "reds"—a cleavage which is frequently widened during periods of rapid change.[26]

The central government experts are further divided over recent economic policy. Thus, for example, some have favored the status quo in terms of China's economic institutions but have seen a need to deemphasize heavy industry and costly, gradiose projects in favor of the previously neglected sectors, such as agriculture and consumer goods industries. Others have called for a radical "restructuring" of the Chinese economy by transferring considerable economic authority from central government ministries to profit-and-loss oriented corporations.[27]

At the same time, the Cultural Revolution and its aftermath politicized generational differences to a marked degree. Michael Yahuda has noted that on one side of the current Chinese political spectrum are the self-styled "older cadres" and "older intellectuals" who were the prime targets of the Cultural Revolution and who have in its aftermath become the main beneficiaries of the new order and the main driving force of the modernization program. On the other side he sees members of the so-called "lost" generation of 20- to 40-year-olds who were trained and became politically active during the Cultural Revolution. They have strong group identity and their goals for China are far different from their elders. In particular, the most outspoken advocates of restraint upon the exercise of arbitrary power and the development of a genuine democracy and legality are in this group. In between are middle-aged officials who are likely soon to inherit the mandate of leadership from the older cadres. They received their training during the so-called "Soviet" period in China with its associated emphasis of command economic development and bureaucratic workstyle. Members of this group have been repeatedly assailed in mass campaigns of the past and have weathered numerous purges. They have found that maintaining a low profile and avoiding making decisions in times of change provides a most useful means of political survival.[28]

Conflicts also exist among different bureaucratic interest groups involved in Chinese decision making, and political factionalism continues to exert strong influence in Chinese politics. Thus, for example, some studies have recently identified a so-called "petroleum faction" in China's leadership. Parris Chang has described it as a group of economists and technocrats who ran the Chinese economy under the late Premier Zhou Enlai's stewardship during 1966–1976, have been identified with the remarkable development of China's petroleum industry, and have been represented in the economic ministries of the State Council. Their influence is said to have been instrumental in promoting the ambitious Chinese economic goals announced at the Fifth National People's Congress in March 1978. They are thought to have strong reservations about the more moderate, consumer-oriented economic policies, advocated by such leaders as CCP Vice Chairman Chen Yun, that have heavily influenced Chinese economic planning since the third plenum of the 11th CCP Congress in December 1978.[29]

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[26] See Jonathan Unger. Constituencies of the Two Line Struggle in Administrative Organization. Paper presented at the Annual meeting of the Association for Asian Studies, March 13, 1981.

[27] See, Clark, Christopher M. Leadership Divisions. China Business Review, March-April 1981.

[28] Yahuda, Michael. Political Generations in China. The China Quarterly, December 1979

Many Chinese military leaders are thought to oppose recent reform measures. Veteran leaders are worried that efforts to streamline the military establishment will result in their demotion or dismissal; military planners are concerned about the low priority given national defense at a time of continued tension with the U.S.S.R.; and there is reported widespread discontent in the PLA about the deemphasis on Maoist ideology which has accompanied many of the reform measures since the third plenum. Other issues include the public humiliation of several PLA leaders associated with Lin Biao and the gang of four during the public trials in Peking in November 1980 and changes in material benefit allocations which work against the interests of rural families who have fathers or sons serving in the PLA.[30]

Lucian Pye has recently emphasized cultural and institutional factors that have impelled Chinese officials to form factional associations which will enhance career security in times of revolutionary change. He has identified several current factional groups. They range from Maoist loyalists known as the "whatever faction" for their strict adherence to whatever Mao said, to the "practice faction," which emerged following the death of Mao: it takes its name from the dictum that "practice is the sole criterion for truth" which has provided the ideological underpinning for much of the recent reform in China.[31]

INSTITUTIONAL COMPLICATIONS

Chinese reformers are hamstrung in their current efforts to mount a sustained political effort to dismiss their opponents because they have repeatedly disavowed the use of the mass campaigns that were employed to purge thousands of officials during the Cultural Revolution. They have been restricted to working through regular party channels in seeking dismissals and other reform, even though those channels in many cases are heavily influenced by officials who oppose reform. In the event, leadership rectification has become a very time consuming process with no end in sight.[32]

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[29] Chang, Parris. Chinese Politics: Deng's Turbulent Quest. Problems of Communism, January-February 1981.

[30] See China News Analysis, Hong Kong No. 1203, March 27, 1981.

[31] Pye, Lucian. The Dynamics of Factions and Consensus in Chinese Politics: A Model and Some Propositions. Santa Monica, The Rand Corporation, July 1980.

[32] It should be noted that little comfort can be derived from those Chinese commentators who judge that a rectification effort like the Yanan campaign of the 1940s would quickly solve China's current leadership difficulties. In fact, that campaign took many years, encompassing almost a decade from start to finish, and it was conducted in a party structure much smaller and probably more cohesive than the current party stucture in China.

A "crisis of competence" further impedes leadership rectification. Having put aside the class struggle between "two lines" which allowed those in power during the Cultural Revolution to dismiss opponents relatively easily on grounds of political disloyalty, the current reformers have been hard put to define criteria for dismissal. In very general terms, current criteria have stressed failure to lead China competently in the pursuit of the four modernizations. However, most leaders who remain in charge at the top of the Chinese administration have fallen short on these grounds. Thus, for example, officials like Yu Qiuli and Kang Shien, who were associated with past extravagance and waste in China's oil development program, remain in powerful positions governing oil matters and other economic affairs. Officials like Gu Mu, who were responsible for the failure of Chinese planners to cut back sufficiently on capital construction in 1979 and 1980, have also retained powerful economic posts. Even Deng Xiaoping, who was in the vanguard of those leaders urging China to learn Western techniques and import large Western plants as a means to speed modernization, continue to direct government affairs at a time when imports from the West and Japan are seen as having led to extraordinary waste and economic dislocation which hurt modernization in China.

Such setbacks and mistakes by top level leaders make it harder to justify dismissal of lower level officers because they have made similar "leftist" mistakes. The situation plays into the hands of those who judge that so many leaders have been subject to such "leftist" mistakes that reform should not involve wholesale purges of those at fault; rather, it should focus on patient study, criticism and self criticism, leading to a gradual transformation of the outlook and workstyle of those involved. Of course, such a mild approach does not lend itself to a quick resolution of the leadership differences that continue to hamper China's modernization effort.

CONTRADICTIONS IN REFORM MEASURES

Effective political reform is also undercut by contradictions and tradeoffs seen in many reform measures. These cause side effects that have a negative impact on basic Chinese interests, and have prompted Chinese leaders to slow or stop reform measures in order to avoid them.

Thus, for example, reform efforts to purge and criticize leaders who loyally followed Maoist policies have sometimes had the effect of undermining Mao's position as the leader of the Chinese Communist Party, the founder of the PRC, and a major source of legitimacy for the CCP's continued monopoly of political power in China. The issue was prominently featured during the trials of the gang of four which began in November 1980.[33] From the beginning, the most controversial aspect of the trials was their treatment of Mao, especially his culpability for the disastrous Cultural Revolution. While some reformers clearly hoped to use the trials to further discredit proponents of Maoist policies, media comment before the trials and the 48-

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[33] For an analysis of the course of the trials, see the weekly coverage in FBIS. Trends in Communist Media.

count indictment indicated that the trials would steer clear of Mao's responsibility for the excesses of the period. (It seems likely that these limits were imposed as a result of a leadership consensus reflecting a compromise between reformers anxious to hold the trails and others, like Hua Guofeng, who consistently battled to preserve Mao's image and the prestige of officials, themselves included, who benefitted from the Cultural Revolution.)

Once the trials got underway, the arguments put forward by two members of the gang of four—Jiang Qing and Yao Wenyuan—apparently severely tested the limits placed on the trials and further complicated relations within the leadership, which were already strained as a result of major discussions then under way over economic and political problems. Jiang Qing's defense that she was acting in accordance with the instructions of the CCP Central Committee and its chairman, Mao Zedong, seemed to catch the court off guard and may have led to the adjournment of her trial from December 12 to December 23. Tensions were probably further heightened in the first week in December by a three part article written by the three surviving children of Liu Shaoqi, whom Jiang stood accused of persecuting to death. The article portrayed Liu's repeated unsuccessful efforts to enlist Mao's help in dealing with the political crisis that was developing at the start of the Cultural Revolution.

The adjournment of Jiang's trial coincided with a CCP work conference, which focused on economic problems and probably also discussed Hua Guofeng's links with the leftists and Jiang's allegations about Mao. A compromise judgment regarding Mao—that he was responsible for starting the Cultural Revolution but was still to be considered innocent of crime—was reflected in a People's Daily Commentator article on December 22, the day before Jiang's trial resumed. The final verdicts on the trials, announced on January 25, 1981, managed to remove one source of nagging controversy from the immediate political agenda; but the issues raised by the trials—particularly the reputation of Mao and the status of Hua—served to complicate high level political relations and slow reform at an already difficult time.

Another example of negative side-effects of reform complicating political change was seen in reform efforts in late 1978 to promote greater democracy, to redress verdicts of the Cultural Revolution, and to hold officials accountable for their past support of Maoist policies. The movement opened a public debate which undermined the influence of Maoist loyalists on the Politburo and opened the way to a generally more pragmatic approach to domestic affairs. However, it led to excesses of self-expression and calls for human rights on the part of an articulate minority in Chinese cities who had close contacts with the foreign press. And it prompted thousands of petitioners to travel to Peking and other administrative centers to seek quick redress for past injustices. Youth who had been sent down to the countryside also took the opportunity to voice complaints and stage demonstrations against the way they were treated.

Some reformers were willing to tolerate these actions in the interest of broader political change, but the consensus of the Chinese leadership swung back by spring 1979 toward a more orthodox approach stressing the four principles.[34] Comment at that time began to advocate a go-slow approach to political reform, warning against "impetuosity" in addresing problems such as the reversal of verdicts made during the Cultural Revolution and the plight of youth sent to the countryside.

Reformers were able to revive their programs later that year and to push anew for such democratic changes as free elections at lower levels of government administration. But the resulting anti-CCP sentiments voiced in election campaigns, persisting underground propaganda activities and unauthorized demonstrations and strikes at universities and work places caused the regime in early 1981 once again to curb political reform in the interest of preserving party control.[35]

Similar contradictions and tradeoffs have complicated recent economic and foreign policy. While not necessarily directly tied to political reform, changes in these areas have exacerbated leadership differences, which in turn hamper the establishment of consensus needed for effective political reform.

Concerning economics, some Chinese reformers have attempted to encourage greater worker productivity through the use of more material incentives, the decentralization of economic decision making and the reduction of administrative control over the economy. The result has been to increase production but it has also increased the government's spending deficit, pushed up inflation, and promoted consumer discontent. As a result, reformers were put on the defensive as leaders started to swing back in early 1981 in favor of policies of closer administrative control over spending on capital construction, closer regulation of prices, and a general retrenchment in plans for economic expansion.[36]

In foreign affairs, Chinese reformers moved to raise China's economic productivity and improve the quality of its science and technology by loosening administrative controls on contacts with foreign countries, especially capitalist countries. Peking began to allow companies from capitalist nations to invest in China, sent large numbers of Chinese students and other delegations abroad, and welcomed foreign experts to work in China. However, the programs required a diversion of scarce Chinese economic resources to pay for foreign trips and salaries. They also were linked with the alleged rise of negative "bourgeois" tendencies among groups in China who had frequent contact with foreigners. They prompted other Chinese leaders to call for closer administrative control of such interchange in the future.[37]

China's close ties with the United States in opposition to the Soviet Union also have had side effects which have prompted some in China to question the current policy. This minority has seen China dangerously overexposed in its confrontation with the U.S.S.R., and without sufficient countervailing support from the United States. On at least two occasions, they have advocated—in indirect but unmistakable language—a more even handed Chinese policy toward both superpowers.

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[34] For background on these events see FBIS. Analysis Report. Chinese Political Debate Since the December Third Plenum. August 1, 1979.

[35] See FBIS. Analysis Report. Political Instability in China Slows Progress on Reforms. February 13, 1981.

[36] See discussion in Christopher Clark, "Leadership Divisions." The China Business Review. March-April 1981.

[37] See report on speech by Huang Kecheng, replayed in FBIS, Daily Report, China. April 13, 1981.

The first instance occurred in April 1979.[38] Faced with a protracted confrontation with Vietnam, newly apparent dislocation in the Chinese domestic economy and increased Soviet pressure along the Sino-Soviet frontier, China used the opportunity of its formal declaration ending the Sino-Soviet alliance to offer its most forthcoming proposal for talks with the U.S.S.R. in a decade. Two days later, Chinese comment favorably highlighted the 1962 foreign policy proposal of Peking's former ambassador to Moscow. During the Cultural Revolution, the proposal was known pejoratively as the "three liquidations and one reduction"—the "liquidation of the struggle against imperialism, the reactionaries and modern revisionism and the reduction in assistance and support for the revolutionary struggles of other peoples." In effect, the proposal called for an easing of Chinese tensions with both the United States and the Soviet Union in order to provide China with a more favorable international environment in which to deal with the drastic economic difficulties it faced following the Great Leap Forward and the withdrawal of Soviet assistance. Reviving publicity to this old proposal in April 1979, so soon after China's remarkably forthcoming call for talks with the U.S.S.R., suggested that some officials in China were interested in easing tensions with the U.S.S.R. during a period of domestic and international difficulties.

Subsequently, Deng Xiaoping and other spokesmen strongly reaffirmed the anti-Soviet basis of Chinese foreign policy and called for the establishment of a "longterm, strategic relationship" with the United States. The Soviet invasion of Afghanistan seemed to drive the Chinese and the United States closer together in cooperation against the U.S.S.R. However, amid renewed signs of Chinese leadership anxiety over economic difficulties and the election of a new U.S. President with close ties to Taiwan in early 1981, Chinese media once again renewed attention to the 1962 foreign policy proposal. This suggested that some leaders again questioned China's strong confrontation with the U.S.S.R. at a time of serious Chinese difficulties.[39]

Meanwhile, Deng Xiaoping's compromise over Taiwan in negotiations with the United States on normalization of diplomatic relations had the positive effect of opening Chinese contacts with the United States and other Western countries. But it also had the negative effect of diluting China's longstanding position that Taiwan is an internal Chinese matter that brooks no foreign interference. In particular, by tacitly allowing the United States to continue to sell weapons to Taiwan, Deng opened the way for United States–China normalization but offended those in China who feel strongly about the claim to Taiwan. As the U.S. arms sales continued and a more pro-Taiwan administration was elected in the United States, China hardened its public line against U.S. arms transfers to Taiwan. This seemed to reflect a shift in the Chinese leadership away from the more accommodating posture of the past, perhaps in order to protect Deng and other foreign policy managers from charges of critics in the leadership that they had "sold out" China's interest in Taiwan for the sake of an accommodation with the United States.

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[38] See Miller, H. Lyman. From the Third Plenum to the April Adverse Current: The Domestic Politics of Sino-Soviet Detente. Paper presented at the Annual Meeting of the New England Regional Conference of the Association for Asian Studies, October 20, 1979.

[39] Hamrin, Carol Lee. The Politics Behind China's Foreign Policy. Paper presented at the annual meeting of the Association for Asian Studies, March 13, 1981, p. 13.

IV. PROSPECTS AND IMPLICATIONS FOR THE UNITED STATES

The checkered record of political reform over the past few years and the serious contradictions in China's current leadership over various policy issues clearly suggest that advocates of strong political reform will continue to meet formidable resistance in the years ahead. As a result, political complications are likely to continue to impede efforts by China's leaders to establish an effective and lasting consensus on a more coherent program to achieve major progress in the four modernizations.

An optimistic scenario for the next few years shows the political reformers, led by such senior leaders as Deng Xiaoping and their younger supporters like Hu Yaobang, fairly rapidly consolidating their hold over central administrative organs by means of intraparty reforms and selected purges. These changes in turn would allow them to implement more consistent policy programs on modernization and more effectively to mobilize cadre throughout the country in a pragmatic pursuit of the four modernizations. They would presumably be better able to offset the variety of negative or complicating side effects that have been associated with many reform measures, and to arrive at an effective modernization strategy that would speed China's economic development and material progress.

A more pessimistic scenario shows growing paralysis in Chinese decision making as Chinese leaders continue to grapple with strongly divergent views on political and economic reforms, are unable to arrive at an enduring consensus on what kind of strategy to use in pursuing the four modernizations, and prove to be unable to manage various contradictions and negative consequences of reform measures. In this situation, the discredited Maoist ideals of the past would combine with growing disillusionment with pragmatism as practiced by Deng Xiaoping and other reformers. Cadre at various levels of authority would persist in past efforts to avoid responsibility for controversial decisions and Chinese administration would drift without effective direction. This scenario could become more likely if China faced a major adverse development such as a year or two of poor harvests, the untimely death of Deng Xiaoping, or a marked increase in Sino-Soviet military tensions.

A different kind of pessimistic scenario shows Chinese leaders dispairing of achieving success with recent political and economic reforms, and reverting to a development model stressing strong central political control. Using the considerable means of political and military power at their disposal, Peking leaders may judge that erratic economic growth under tight party control would be preferable to the danger that further reforms might permanently undermine the leadership's grip on power. The alternative to tight political control could be the kind of uncontrolled situation that emerged in Poland in 1980–81.

Perhaps the most likely scenario for the next few years sees continued slow and halting progress by Deng and his reform minded associates toward the establishment of a more pragmatic, technically competent leadership in the Chinese party, army and government that will strive to develop a more effective approach to the four modernizations. Progress in political rectification will continue to be slow because of persisting strong resistance from opponents of various reforms who still wield power in the leadership, the lack of a commitment to reform on the part of many cadre at lower levels, and the difficulty reformers will continue to have in handling the contradictions and negative side effects of many reform measures.

Opposition to reform measures will likely remain diffused, as it has been for the past several years. Unable to offer a coherent alternative strategy as to how China should develop its wealth and power, officials dissatisfied with reform measures will likely remain in the role of naysayers. They will be capable of using their power to delay and complicate change, but they probably will not develop the power and the program with which to push aside Deng and his backers, who will continue to pursue strong political reform.

IMPLICATIONS FOR THE UNITED STATES

While a rapidly developing and powerful China may eventually pose a serious challenge to American interests in the future, it seems clear that U.S. interests would be well served over the next few years if political reforms were to succeed rapidly, allowing the Chinese to move more quickly toward economic modernization. Under these circumstances, economic ties with the West would probably grow steadily, strengthening the already close security collaboration between the United States and China. Peking would remain preoccupied with domestic development, solicitous of its non-communist neighbors, and unlikely to pursue ideological causes of the past that might compromise practical contemporary interests in modernization and development. A continuation of China's moderate stance on Taiwan would be expected under these circumstances.

Paralysis in Chinese decision making or a strong reassertion of firm political control in China would likely work against current U.S. interests. Under both scenarios, China would be less open to foreign trade and contacts with the West. If Chinese policy making became mired in bureaucratism and political infighting, China's resulting internal weakness might invite increased Soviet pressure, risking a fundamental shift in the Asian balance of power. This, in turn, would unnerve U.S. and allied investors and upset important American economic and strategic partners in Japan and elsewhere in East Asia. Meanwhile, a future China dominated by a Stalinist model of tight political control could well try to mobilize popular support with antiforeign exhortations. It also might be inclined to take a chauvinistic stance on Chinese territorial claims such as Taiwan, disputed islands in the East and South China Seas, and disputed offshore oil and other resource rights in those areas.

Slow and halting Chinese progress toward political reform would probably serve U.S. interests to some degree, though not as much as the scenario promising more rapid political and economic progress. Slower modernization would likely translate into fewer opportunities for U.S. business in China. Persisting leadership differences would also continue to complicate closer Chinese interchange with the West. China would probably continue to value strongly the role played by the United States in helping China to sustain a balance in Asian and world affairs against the U.S.S.R. and favorable to Chinese interests. Such a balance would seem essential as the Chinese grapple with problems of internal development. Nevertheless, critics of recent policies may, as in the past, voice dissent about the general orientation of China's pro-American policy or complain about some of the compromises (e.g., over Taiwan) which China was compelled to make in order to develop good relations with the United States.

CHINA: ECONOMIC MODERNIZATION AND LONG-TERM PERFORMANCE

By Arthur G. Ashbrook, Jr.*

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I. INTRODUCTION

This article deals with past growth patterns, present growth policies, and future growth prospects in the People's Republic of China. It emphasizes developments in the 3 years since the publication of the Joint Economic Committee's last volume on the Chinese economy,[1] including policy issues involved in Beijing's preparations for the Sixth Five-Year Plan, 1981–85. The article also sketches basic economic trends for the whole span of Communist rule over China, 1949 to date, and discusses the general obstacles to modernization in the next two decades, out to the year 2000. The article updates the theme of "strong but erratic economic growth" presented in the author's previous contributions to the JEC's China compendia.[2]

Section II presents the key findings of this survey of China's modernization efforts. Section III concerns the disputes over the proper strategy for growth. It emphasizes the unending tension between ideological purity and practical results, as seen particularly in the leadership's vacillating attitude toward private economic activity. Section IV surveys the chances of maintaining the long-term growth rates of the past, while Sections V through VIII summarize growth prospects in the agricultural, industrial, foreign trade, and defense sectors. Section IX takes a brief look at the relation of scientific and technological factors to growth. Section X discusses population as the single most important element in China's growth picture, and Section XI brings in the related subject of living standards. Section XII considers China's "second economy," that broad range of extra-official activities which are doctrinally embarrassing and economically indispensable.

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*The National War College, Washington, D.C. The judgments in this article do not necessarily reflect the judgments of The National War College, the Department of Defense, or the U.S. Government.

[1] The Chinese Economy Post-Mao, Washington, D.C., 1978. This volume is hereinafter referred to as JEC–78.

[2] For a listing of these contributions, see Arthur G. Ashbrook, Jr., "China: Shift of Economic Gears in Mid-1970's," JEC–78, p. 209.

A note on terminology: The term "Cultural Revolution" originally referred to Mao's assault on the Party/state bureaucracy in 1966–69, when (a) millions of Red Guards helped dismantle much of the official control structure; (b) industry, transport, and construction suffered severe short-term interruptions; and (c) order was restored only with the intervention of the army and the rustication of the youthful revolutionaries. Subsequently, the term was used in a second, broader sense to cover the whole ten-year period of political struggle, 1966–76. This "Cultural Revolution extended" came to a head in 1976 with the death of Zhou Enlai in January, the Tienanmen incident in April, the death of Mao in September, and the arrest of the Gang of Four in October. Economically, the years 1970–76 were less damaging than 1966–69, some severe factory disturbances in 1974 and 1976 notwithstanding. Unless otherwise specified, the term "Cultural Revolution" in this article refers to the shorter period, 1966–69.

This article includes information received through May 25, 1981.

II. KEY POINTS

1. After an initial burst of overoptimistic economic plans, the post-Mao government has brought its modernization goals in line with China's real needs and available resources.
2. The government has provided more inputs for the agricultural sector, raised farm procurement prices, and encouraged private plots and peasant markets.
3. Concurrently, Beijing has canceled or postponed major construction projects, particularly heavy industry projects with expensive foreign equipment.
4. The People's Liberation Army, while continuing to improve in weaponry and discipline, has had to accept a stretchout in its reequipment program.
5. Scientists have returned to laboratory and classroom, universities have restored their admission standards, and gifted students have gone abroad to master Western technology.
6. The government has reaffirmed the clearcut goal of the population control program—one child per family.
7. The consumption sector has gained new impetus from measures favoring agriculture, light industry, and small-scale handicraft and service enterprises.

8. The People's Republic has broadened its participation in the international economic system, joining the IMF and World Bank and seeking credits from a wider variety of sources.

9. These pragmatic programs will help offset factors pushing down growth rates in the 1980's, such as diminishing returns in agriculture, the overloading of transportation and communication facilities, the dearth of modern accounting and statistical methods, the apparent spread of cynicism and self-indulgence, and the drawbacks of a Soviet-type system for running an increasingly complex economy.

10. In particular, the recent peaking of oil production at 2 million barrels per day (plans had called for 5 million b/d by 1985) will dampen growth by reducing China's ability to buy foreign machinery and technology.

11. Because of the absence of a charismatic leader like Mao Zedong and the development of deeper roots for the economy, political turbulance probably will disturb economic activity much less in the 1980's than in the first three decades of communist rule.

12. The huge population will remain the single most dangerous long-term threat to maintaining rapid growth; today's one billion Chinese will have increased by at least 200 million at century's end, even assuming the success of the government's population control program.

13. In short, while growth rates in China almost certainly will fall off in the remainder of the century, the new pragmatic policies will greatly reduce chances of a precipitous decline.

14. The People's Republic will realize substantial absolute gains in agriculture, industry, defense, and science and technology, while remaining far behind the standards of Japan and the leading Western nations.

III. ECONOMIC STRATEGY: ACCENTUATING THE PRAGMATIC

Since 1949, the Chinese nation-state has represented a changing mixture of ancient cultural values, Maoist revolutionary ideas, and modern technological imperatives. Mao in sinicizing the Marxist-Leninist revolutionary process stressed volutarism (i.e., belief in the primacy of will), egalitarianism, practice (as opposed to intellectual theories), and people's war; he demanded complete subordination to the Party—though not feeling himself bound by that discipline. Five years after his death, his successors are interpreting the Great Helmsman as a gifted revolutionary, uniquely equipped for seizing power in twentieth century China, but an increasingly ineffective administrator of power in his old age.[3] The new de facto chief, Deng Xiaoping, and his associates view Mao's suspicion of intellectualism and bureaucratization as barriers to the proper development of production and research.

Two of the major roles played by Mao were as (a) the founding father of a new China, which had "stood up" after a century of humiliation; and (b) the inspirational leader of a small faction of ideological purists who promoted such radical campaigns as the Great Leap Forward and the Cultural Revolution. With Mao's death and the downfall of the Gang of Four, economic strategy quickly began to reflect the vested interests and practical concerns of the majority of the Central Committee members.

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[3] For the current definitive interpretation of Chairman Mao's contributions and his mistakes, see the speech by Huang Keching, member of the CCP Central Committee and permanent secretary of the Central Discipline Inspection Commission, Beijing, Xinghua domestic service in Chinese, as translated in *FBIS-CHI*, Apr. 13, 1981, K6–17. In the present article, the symbol FBIS–CHI refers to the Daily Report on China of the Foreign Broadcast Information Service, distributed by the National Technical Information Service of the U.S. Department of Commerce.

The post-Mao leadership at first badly misjudged the growth potential of the economy. The overoptimism culminated in Chairman Hua Guofeng's call in February 1978 for grain output of 400 million tons by 1985 (compared with less than 300 million tons in 1977), steel output of 60 million tons (compared with 24 million tons in 1977), oil output of 5 million barrels per day (compared with 2 million b/d in 1977), and a huge capital construction program involving several billion dollars worth of foreign equipment. By the end of 1978, the leadership was forced to recognize the need for a three-year period (1979–81) of "readjusting, restructuring, consolidating, and improving the national economy." Subsequently, the planners extended the readjustment period and presumably will specify moderate targets for the Sixth Five-Year Plan, 1981–85, now under discussion. (The annual economic plan continues to be the operational plan under which specific production goals, enterprise quotas, material balances, construction schedules, and financial allocations are worked out.)

The Chinese thus have revised their economic strategy to overcome the problems of "a national economy of high speed, high accumulation, poor results, and low consumption."[4] They plan to run the economy less tautly and to increase consumption as a share of gross national product (GNP) at the expense of investment and defense. Of the "four modernizations",[5] agriculture is to have the highest priority and defense the lowest. Industry is being geared to (a) supply more products to agriculture; (b) furnish more textiles, bicycles, TV sets, and other goods to the consumer; and (c) provide more ample supplies of energy. With the construction program being substantially reduced, the industrial sector no longer will press the production of steel and machinery items. The upshot has been (a) a 25-percent drop in 1980 in investment covered by the national budget, and (b) a reduction in the past two years of aggregate investment as a portion of GNP, from a guesstimated 30 percent back down to 25 percent.[6]

The reduction in the economy's speed and rate of accumulation, the Chinese economists argue, will ease steel shortages even though steel imports drop and domestic steel production levels off. Throughout the economy, "poor results" will be replaced by "good results" in quality of output and timely completion of construction projects. "High consumption" will follow from the rationalization of the production process and the trimming of allocations for investment and defense.

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[4] Beijing, *Hongqi* (*Red Flag*), No. 6, Mar. 18, 1981, as translated in *FBIS-CHI*, Apr. 7, 1981, K9.

[5] In his major speech of January 1975, Premier Zhou Enlai had called for the transformation of China into a modern socialist nation by the year 2000 through the modernization of agriculture, industry, defense, and science and technology.

[6] While we can confidently say investment will drop to a lower (still very high) level as a share of GNP, we do not yet have precise estimates. The Chinese have been saying that "accumulation" as a percent of Marxist-style national income was pushed up to 36.6 percent in 1978, that is, before the readjustment in economic policy. For a discussion of investment as a share in national income, see the report of Beijing, Xinhua domestic service, May 15, 1980, as translated in *FBIS-CHI*, May 20, 1980, L9–12.

The readjustment in priorities and plans, however, will relieve China's economic problems only if Party and state leaders can operate effectively within the limitations of the centrally planned economic system. The leadership recognizes the inconsistencies in its economic management policies. It proposes to tighten central allocation of raw materials, closely regulate loans for construction projects, standardize the accounting and statistical systems, and curb the payment of excessive bonuses. Yet it simultaneously proposes to allow more leeway for local government organizations and enterprises to adjust production to local conditions. Furthermore, the regime has been openly recognizing the usefulness of a complementary economy of small-scale producers, whose activities are essentially beyond the scope of the plan. For the remainder of the decade the leadership will be steering between these conflicting objectives.

TABLE 1.—CHINA: ECONOMIC RESULTS, 1949–80

Period	Overall results	Industrial results	Agricultural results	Foreign trade results	Consumer welfare results
1949–52: Rehabilitation.	Return to pre-Communist level of economic activity through imposition of "economic law and order".	Reactivation of idle capacity as fighting ends and flow of raw materials resumes.	Return of fields to operation; elimination of landlord-gentry class; land given to peasants.	Imposition of strict government controls and switch to Communist trading partners.	End of civil war, gross starvation, and inflation; rekindling of hope; distribution by ration.
1953–57: 1st 5-yr plan.	Successful buildup of industrial base under Soviet-style plan and with Soviet aid.	Increase in capacity/output steel, coal, cement, electric power, and simple machinery	Gains in output from resources already in sector; collectivization in stages.	Growing volume, with basic products being exchanged for Soviet machinery.	Stabilization of living standards at Spartan but improved levels; tying of individual to job.
1958–60: Great Leap Forward.	Disastrous overstrain of economy in attempt to double industrialization pace; end of Soviet aid.	Ruinous rise in factory quotas and work pace, with deterioration in quality.	Bumper 1958 crops, then big drop, 1959–61; poor weather ill-fated communes, impractical policies.	Sharp spurt, then drop caused by collapse of domestic economy.	Near starvation, collapse of morale when Leap fails; dissention extended to army rank-and-file.
1961–65: Readjustment and recovery.	Quick-footed recovery of economic balance by retreat from Leap Forward policies.	Rationalization of output; investment focused on oil, electronics, agricultural-support branches.	Quick return to growth via better weather, smaller farm units, massive inputs.	Shift to Japan and Western Europe as suppliers of industrial imports.	Restoration of living standards to Spartan levels; ban lifted on private plots.
1966–70: 3d 5-yr plan.	Cultural Revolution (1966–69) break in industrial momentum due to political turmoil.	Sharp dip in industrial output, 1967–68; gains in capacity continued.	Continued growth on basis of generally good weather and ever-mounting inputs.	Temporary dip because of dislocations in planning and production.	Maintenance of living standards despite turmoil; private plots undisturbed; higher education wrecked.
1971–75: 4th 5-yr plan.	Resumption of economic growth except for politically related interruptions, e.g., in 1974.	Gains in capacity/output; oil a star performer; lag in coal and steel; factory disorders.	Further basic advances in inputs of labor, irrigation equipment, seeds, and fertilizer.	Resumption of growth in line with domestic gains; cautious use of credit.	Gradual gains in diet, clothing, housing, durables, health, working conditions; population control program.
1976–80: 5th 5-yr plan.	Infighting attendant on death of Mao and Zhou; attempt to promote "four modernizations."	Marked shift toward light industry; peaking of oil output; Western technical support.	Continued growth in output; higher farm prices; gradual rise in technical level.	Overambitious orders for Western equipment to spur modernization; too large to be absorbed.	Continued welfare gains but short of expectations; wage increases; population growth on downtrend.

TABLE 2.—CHINA: MAJOR ECONOMIC INDICATORS, 1949–80 [REV. AUG. 14, 1981]

Period	GNP (billions of 1980 dollars)	Population midyear (millions)	Population increase (percent)	GNP per capita (1980 dollars)	Agricultural production (1957=100)	Grain output (millions of metric tons)	Grain output per capita (kilograms)	Industrial production (1957=100)	Steel output (millions of metric tons)	Coal output (millions of metric tons)	Oil output (millions of barrels per day)	Percent trade with Communist countries
1949–52: Rehabilitation:												
1949	71	538	-------------	131	53	111	205	20	0.16	32.4	0.002	Negligible
1950	86	547	1.77	158	64	130	235	27	.61	42.9	.004	29
1951	100	558	1.95	179	72	141	250	38	.90	53.1	.006	51
1952	118	570	2.11	206	84	161	280	48	1.35	66.5	.009	70
1953–57: 1st 5-yr plan:												
1953	123	583	2.23	211	84	164	278	61	1.77	69.7	.012	68
1954	127	597	2.42	213	84	166	275	70	2.22	83.7	.016	74
1955	140	612	2.50	229	94	180	291	73	2.85	98.3	.019	74
1956	150	626	2.40	240	97	188	297	88	4.46	110.4	.023	66
1957	159	642	2.46	248	100	191	294	100	5.35	130.7	.029	64
1958–60: Great leap forward:												
1958	180	658	2.46	274	103	196	295	142	11.08	270.0	.045	63
1959	170	672	2.25	253	83	171	252	173	13.86	300.0	.074	69
1960	156	682	1.38	228	67	141	206	181	18.66	280.0	.10	66
1961–65: Readjustment and recovery:												
1961	125	682	.01	183	69	146	215	105	8	170.0	.11	56
1962	140	682	.00	205	79	163	238	111	8	(1)	.12	53
1963	158	692	1.53	228	86	175	250	134	8	(1)	.13	45
1964	182	712	2.93	256	98	194	268	161	9.6	214.0	.18	34
1965	203	736	3.33	276	101	194	260	199	12.2	232.2	.23	30
1966–70: 3d 5-yr plan:												
1966	232	759	3.04	306	114	220	286	232	15	271.4	.29	26
1967	226	780	2.86	290	120	230	291	202	10	190.0	.28	21
1968	228	802	2.79	285	115	221	272	221	9	235.8	.30	22
1969	252	825	2.87	305	119	230	275	266	16	281.6	.43	20
1970	282	848	2.82	333	126	243	283	316	17.8	327.4	.60	20
1971–75: 4th 5-yr plan:												
1971	301	871	2.64	345	130	246	279	349	21	353.6	.77	23
1972	312	892	2.40	350	126	240	266	385	23	376.5	.90	21
1973	351	912	2.23	385	141	265	288	436	25	398.1	1.14	17
1974	364	931	2.14	391	146	275	292	455	21	403.0	1.36	17
1975	388	950	2.01	408	148	284	296	502	24	478.0	1.54	16
1976–80: 5th 5-yr plan:												
1976	395	967	1.79	408	152	286	293	508	20.5	483.0	1.74	18
1977	423	982	1.60	437	155	283	286	581	23.7	550.0	1.87	16
1978	479	997	1.53	480	169	305	303	659	31.8	618.0	2.08	14
1979	520	1,012	1.50	513	183	332	326	716	34.5	635.0	2.12	12
1980	552	1,027	1.46	538	188	320	309	778	37.1	620.0	2.12	12

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[1] Not available.

IV. GNP: MAINTAINING GROWTH

The People's Republic of China has posted an impressive overall growth record. It has provisioned a huge and rapidly growing population, channeled a large fraction of output to the swift expansion of industrial capacity, and mastered ever-increasing amounts of post-World War II technology. In contrast to most other developing countries, China has steered clear of massive foreign debt, prevented uncontrolled migration into urban areas, devised a practical rural development and employment strategy, and established domestic production capacity for a variety of modern armaments.

On the minus side, political turbulence has interrupted growth, notably during (a) the Great Leap Forward (1958–60) when the country was brought to the brink of starvation and the downfall of the revolutionary government, and (b) the Cultural Revolution (1966–69) when industrial development dipped sharply and the universities were closed. Furthermore, the economic record has been marred by problems endemic to Soviet-style economies such as shortages of raw materials and transport, the pile-up of unusable goods, delays in finishing construction projects, large-scale falsification of statistics, and concealed inflation.

Table 1 divides the first 32 years of the People's Republic into seven periods and summarizes economic results for each period by major sector of the economy. Table 2 provides a number of basic economic time series for the 32 years. These tables give an accurate picture of general trends in the Chinese economy, even though many of the absolute numbers lack precision and even though the GNP numbers have a moderate upward bias. Appendix B deals in more detail with the problems of Chinese economic statistics.

The final year of the First Five-Year Plan, 1957, serves as a balanced base year for looking at Chinese growth rates. Growth rates, 1958–80, are approximately as follows: GNP, 5–6 percent; industrial production, 9 percent; agricultural production, 2–3 percent; and population, 2 percent. This general pattern of growth is typical of communist countries— high rates of growth in industrial output and investment in contrast to low rates of growth in agricultural output and consumption. Under these circumstances, consumers normally find supplies of consumer manufacturers increasing more rapidly than food supplies, and planners have to supplement domestic food production with food imports, even in good crop years.

China has formidable assets for maintaining solid growth in the 1980s—the natural resources of a superpower, a homogeneous and industrious population, and a culture emphasizing education and organizational skills. Moreover, China has the perverse advantage of lagging one or two generations behind technologically, which gives a continuing potential for large catch-up gains.

At the same time, China will face intensified population pressures on food supplies, greater costs in producing raw materials and fuels (notably oil), and a pressing need to upgrade communication and transportation facilities. In addition to constraints arising out of its own unique domestic problems, China also will be affected by the adverse global trends that are bringing to an end the extraordinary post-World War II spurt in growth rates.

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China's readjustment strategy for the early 1980's seemingly will lower growth rates because investment is being curtailed as a percent of GNP and imports of foreign equipment and technology are being sharply cut. Growth rates, however, may not be hurt by this strategy per se since the economy has not been digesting the higher flow of investment and since an emphasis on consumption goods may stimulate the productive effort of worker, peasant, and bureaucrat. A second consideration softening the downward pressure on growth is the expected absence of big swings in the economy touched off by political turbulence. Political conflict should be less violent than in Mao's lifetime, and the economy, having obtained a momentum of its own, will be less vulnerable to political shock.

In the absence of a major war, the People's Republic probably will experience reasonably strong growth in the forthcoming decade but at rates drifting down below the average Chinese rates of the past two decades. This conclusion is consistent with the middle path of three alternative paths for the 1980's, as summarized below:

The high path: Characterized by a give-and-take political consensus,[7] rapid rationalization of industrial and construction activities, good crop weather and further permissive rural policies, large-scale import of grain and relevant technology on bargain credit terms, low-profile defense allocations, rapid increase in technical training, and strictly administered population control measures.

The middle path: Characterized by political infighting and occasional changes in economic guidelines, partial success in rationalizing industrial and construction activities, average crop weather and the current level of permissiveness in rural policies, middle-level import of grain and technology on moderate credit terms, medium-profile defense allocations, steady increase in technical training, and a spottily administered population control program.

The low path: Characterized by new outbreaks of political turbulence and major zigzags in economic policies, failure in reducing the wastes and delays in industry and construction, a series of poor crop years and a tightening of controls over private rural activities, low-level import of grain and technology with resultant pressure on domestic resources, high-profile defense allocations, slow pace in technical training, and loss of drive in population control matters.[8]

V. AGRICULTURE: FIGHTING OFF DIMINISHING RETURNS

The agricultural sector, operating since Mao's death within an essentially stable organizational and technological framework, has kept pace with the needs of a growing population. Except for the important element of land acreage, inputs of productive factors have steadily increased: (a) the numbers, physical health, and skills of labor have continued to grow; (b) the tremendous task of maintaining and extending water control facilities, backed by equipment and materials from the industrial sector, has moved along on a broad scale; (c) additional quantities of fertilizers and improved seeds have been introduced and in a more effective manner; and (d) the Chinese have begun the re-building of the scientific and technological program in agriculture following a decade (1966–76) of ideological attacks on educational and S&T organizations.

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[7] For a discussion of alternative political paths, see Alan S. Whiting, "China and the Superpowers: Toward the Year 2000," Daedalus, fall 1980, pp. 97–114.

[8] Of course, the general growth results of the middle path are likely to come, not from the attainment of in-between results in all sectors, but rather from the averaging of a few successes, a few partial successes, and a few failures.

Output of grain in the past five years has moved from slightly less than 300 kilograms to slightly more than 300 kilograms per capita. Short-term weather conditions continue to dominate production results; however, a gradual narrowing of fluctuations along a rising trend line is presumed for the 1980's because of further improvements in water control facilities, in management, and in the application of S&T in the sector.

The post-Mao years have witnessed a cautious expansion of private plots, rural markets, and household handicrafts, an expansion likely to be given positive support in the Sixth Five-Year Plan period. Private plots account for roughly 5 percent of farm acreage now, some communes permitting as much as 15 percent in private acreage. Other supplemental rural activity—which has excellent prospects because of the large amounts of available labor and the support of pragmatic official policies—includes the growing of industrial crops, rural industry, livestock-raising, aquaculture, and forest products.

The Beijing regime has pulled back from the irresponsible agriculture targets announced in 1978 and has adopted policies that provide enough resources and incentives to ensure considerable aggregate growth in the 1980s—but not much growth in per capita food supplies. The Maoist policies favoring mammoth agricultural production units, egalitarian distribution of product, and wholesale mechanization have been shoved aside by policies providing for smaller units, higher procurement prices and other material incentives, and selective mechanization to raise yields rather than to save labor. Under a so-called "production responsibility system" more than half the production teams are assigning fixed production quotas to small groups and allowing the groups to retain above-quota output for their own use. Beijing, although constantly tempted to reassert central control and ideological discipline in agriculture, seems to be recognizing the irrationality of using its scarce administrative resources for detailed management of more than 800 million rural people.

Because the pre-Communist Chinese had over the centuries pushed agricultural production out to very difficult terrain with desperate skill, the PRC today has little prospect of adding more land to feed the now doubled population; the development of new acreage for agriculture is being offset by the preemption of existing farmland for factory sites, new rail lines, housing construction, and military facilities. Although the Sixth Five-Year Plan probably will call for considerable output gains from the completion of water control projects, most of the land best suited for these projects already has been brought under production.

VI. INDUSTRY: LIGHTENING THE PRIORITIES

As part of the readjustment policy announced in early 1979, Beijing moderated the pace of industry and abruptly shifted emphasis from heavy to light industry. Official figures for industrial growth reflect the change in policy:

[Percent gain over previous year]

Year	Total industry	Heavy industry	Light industry
1978	13.5	15.6	10.8
1979	8.5	7.7	9.6
1980	8.7	1.4	18.4

The leadership was reacting to signals of serious overloading and misdirection in industry, such as growing shortages of raw materials and power, the pile-up of unwanted goods in warehouses, and continued lags in construction timetables. The industrial readjustment, which is to extend at least through the end of the Sixth Five-Year Plan period in 1985, has the following features:

1. A drop in growth rates in heavy industry and a sharp rise in growth targets in light industry, to help ease shortages of power and industrial raw materials, to add to immediate consumer satisfaction, and to provide new jobs for youth.
2. Within heavy industry, a lesser emphasis on steel, machinery, and military goods, and a greater emphasis on energy, equipment for the agricultural sector, and consumer electronics.
3. A renewed effort to slash the volume of resources tied up in uncompleted construction projects through reducing the scope and funding of the construction program.
4. Increased vocational training in middle school curriculums, to meet the needs of industry for technicians and to reduce the number of jobless middle school graduates.
5. Another attempt to improve industrial management in the face of tensions between the need for decentralized decisionmaking based on local conditions and the need for tighter centralization to prevent excessive competition for raw materials and duplication of industrial capacity.

These measures should reduce shortages, improve living conditions, and lay the groundwork for solid long-term growth. Because growth is now from a larger base and because easy growth opportunities are harder to find, growth of industrial output in the 1980's will fall considerably short of the 9-percent long-term average. Economic planners worry especially about the effects of the leveling-off of oil and coal production. Oil output had jumped from 200 thousands barrels per day in 1965 to 2 million b/d in 1978. After Mao's death, the authorities had been talking of output reaching 3 million b/d in 1980 and 5 million b/d in 1985; instead, production has leveled off at 2 million b/d. Coal production, which had risen to more than 600 million tons a year from 200 million tons in 1965, fell slightly in 1980 and will be held back by the long-time failure to develop new fields. Oil then will not be financing large imports of capital equipment in the near term, and sizable investment resources will be diverted to restoring growth in oil and coal.

VII. Foreign Trade: Broadening International Ties

If foreign trade were viewed solely as an instrument to raise growth rates, the PRC would (a) sell raw materials, processed foods, labor-intensive manufactures, and tourist services; and (b) shop in world markets for the best buys in basic foods, industrial materials, medium-technology machinery, high-technology educational and consulting services, and low-interest loans. Other considerations of course enter into Beijing's calculus—the great weight given to the idea of China as a proud self-sufficient nation, the state of political relations with customer and supplier countries, the prestige of having the most advanced technology, and the trade-off between sending brilliant students to foreign universities and exposing them to the lures of capitalist societies. The new readjustment policy takes all these foreign trade factors into account—with an improved perspective as to how rapidly and how comprehensively foreign trade can contribute to China's modernization over the next two decades.

Because of the overambitious extension of the construction front, the leadership has moved in the last two years to cancel or postpone several billion dollars worth of contracts on foreign-assisted projects at various stages of implementation. On the export side, China has explicitly recognized the importance of identifying labor-intensive foodstuffs, manufactures, and handicrafts with good world market potential; Beijing has okayed dozens of co-operative agreements with foreign firms involving a variety of arrangements on the furnishing of labor, raw materials, technical expertise, and marketing services. Another potential source of expanded foreign exchange earnings is the China Building Engineering Corporation whose workers build hospitals, housing units, hotels, and restaurants in foreign countries.[9]

The P.R.C., able to allocate one-fourth of domestic output to investment, has had no need to adopt the classical development model of borrowing from abroad to build up capital plant. In any case, the People's Republic has traditionally avoided foreign indebtedness. This reluctance, born of nationalistic pride and a conservative financial bent, has now been reinforced by the realization that costly foreign equipment sometimes yields little benefit. Finally, China has broadened its participation in the global economic system by joining the World Bank, the International Monetary Fund, and other international organizations, thereby gaining access to loans on favorable credit terms.

Foreign trade may be expected to support Chinese growth in the 1980s through (a) the continued supply of low-cost food to cities of the north and east and (b) the provision of machinery and technology at the cutting edge of the modernization effort. The readjustment policy already is winnowing out imports of slight benefit and increasing foreign exchange earnings from activities in which China enjoys considerable comparative advantage.

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[9] For a short account of this corporation, see Beijing, Xinhua domestic service, Mar. 21, 1981, as translated in *FBIS–CHI*, Mar. 24, 1981, A4. This account probably overstates the achievements, as opposed to the potential, of the corporation.

VIII. Military Sector: Defending the Periphery

The Chinese leadership has sided with those urging low-key modernization of the People's Liberation Army until the underlying industrial and scientific bases have been strengthened.[10] Even under the new budgetary constraints, however, the PLA will continue to improve in firepower, mobility, and communications. Over the coming decade, the PLA will remain a formidable defense force, composed mainly of tough, well-disciplined infantry. Of course, the U.S.S.R. will also be strengthening its armed forces, and the Chinese probably will fall farther behind the Soviets in relative military strength. Weapons in production and inventory in China will remain one or two generations behind those in use in modern military establishments. In all branches of the military services, China will continue to have difficulties in introducing the next generation of weapons into serial production.

The PLA is a labor-intensive force in a economy where unspecialized labor has low opportunity cost and where (roughly) only one of ten males reaching military age needs to be taken into the armed forces. Although military service no longer enjoys its former standing as the most attractive alternative open to the great majority of Chinese youth, the PLA almost certainly will have little trouble in annually inducting one million volunteers of rude health, complete political loyalty, and basic educational attainments. With the restoration of China's educational system, a new emphasis on vocational training in the middle schools, and its own training activities, the PLA should steadily upgrade its average level of technical skills in the 1980's. Later, when the economy can support increased military production, the PLA will be better able to absorb the new equipment.

As the result of the shattering of much of the Party/state bureaucracy during the Cultural Revolution, 1966–69, and the intervention of the military to preserve social order, the PLA began to exert more influence in the setting of national policy. Expenditures on defense sharply increased in 1970–71. With the reassertion of civilian control, however, military spending was cut 10 to 15 percent in 1972 and then crept up an average of one or two percent in the next several years. As part of the current readjustment program, the Chinese government cut the overt 1980 military budget to 19.3 billion yuan, down from the 22.3 billion yuan reported for 1979. The 1979 figure was 2.0 billion yuan above plan, presumably because of the incursion into Vietnam. Budgeted outlays were to be further trimmed in 1981, by an unspecified amount. Aggregate military spending today is roughly the same as in 1970–71 when China's GNP was little more than half the present level. In the Sixth Five-Year Plan period (1981–85), military spending probably will expand less rapidly than GNP as the leadership rationalizes industry and channels resources toward consumption. Purchases of weapons from abroad probably will be on a small scale and feature items useful against an invader, such as anti-tank guns and air defense systems.

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[10] For an excellent account of the strategy, equipment, and status of the PLA, see Angus M. Fraser, "Military Modernization in China," *Problems of Communism*, September-December 1979, pp. 34–49.

IX. SCIENCE AND TECHNOLOGY: MOBILIZING BRAINPOWER

The rebuilding of academic standards throughout the whole educational system, the restoration of scientific laboratories and the flow of scientific information, the recent emphasis on strengthening technical training in the middle schools, and the dispatch of several thousand top-drawer students to leading universities in Japan and the West together constitute one of strongest growth factors for the 1980's. The modernization of science and technology offers unique opportunities for high percentage gains since in this area the Chinese have been using the smallest fraction of their potential. In 1980, for example, only 285,000 of the 3.3 million candidates taking the examinations were admitted to the universities—and the 3.3 million had survived a previous round of examinations.[11]

Over the next decade we should see rapid growth in the number of doctors, nurses, scientists, economists, statisticians, legal personnel, and technicians of various skill and the production of greater quantities of measuring instruments, computers, and other advanced equipment of use in both civilian and military programs.

Higher-than-average growth in science and technology is made feasible by (a) the low starting point, a legacy of the ten years of the Cultural Revolution; (b) the motivation of China's young and ambitious population; and (c) the potential for comparatively inexpensive gains from foreign sources of technology. China will still be reaping the advantages of being behind.

X. POPULATION: STEMMING THE FLOOD

The birth of the next child has the greatest negative externalities of any event in China today. The population—which has grown from half a billion people at the time of the founding of the P.R.C. to 1 billion today—will further increase over the next two decades by a number equal to the present population of the United States, even assuming the current population control program is steadily pushed.

The bits and pieces of population data released by the government are not internally consistent, and Beijing recently admitted that lower level bureaucrats have frequently underreported the population in their jurisdictions to conform with the goals of the population control program.[12] In early 1980, Chinese demographers made computer projections of the P.R.C. population, using their shaky data with a 1978 base of apparently 960 million people.[13] Their results illustrate the importance of the population issue:

	Population in year 2000 (billions)	Peak population (billions)
Number of children per woman of childbearing age:		
3	1.414	No peak (would be 4.260 by year 2080).
2.3 (going rate)	1.282	Not given.
2	1.217	1.539 in year 2052.
1.5	1.125	1.171 in year 2027.
1	[1] 1.054	1.054 in year 2004.

[1] In the year 2004.

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[11] Paris AFP dispatch in English, Dec. 2, 1980, reprinted in *FBIS-CHI*, Dec. 3, 1980, L12–14.

[12] For recent Chinese revelations of statistical malpractices, see Appendix B.

[13] For details on the computer runs, see Beijing, Xinhua domestic service, Feb. 13, 1980, as translated in *FBIS-CHI*, Feb. 15, 1980.

The population series used in this article, and presented in Table 2, is a medium-level series prepared by the U.S. demographer, Dr. John S. Aird; the series has a 1978 figure of 997 million and a year 2000 figure of 1.282 billion, by coincidence the same as the year 2000 figure in the second Chinese series, above, but calculated from a different base.[14] Regardless of the precise numbers, one point stands out. The momentum in the huge Chinese population is the key to the ultimate outcome, that is, a difference of a "mere" 100 million in the turn-of-the century population can foreshadow a difference of several billion in the peak population or a failure of the population to peak at all. (China's food supply system presumably would be overwhelmed before the multi-billion populations spewed out by the computer for the late twenty-first century would ever come into being.)

The rationalization of economic policy in the post-Mao era, including the dramatic readjustment of goals in early 1979, has led to the following situation in the population arena:

(*a*) The promulgation of a clearly understandable goal: One child per family. So far, two children per family have had to be tolerated as an interim concession to public feeling but the crackdown on going beyond two has become increasingly severe; Communist cadres in violation have been reduced in rank in some flagrant cases. The regime hopes that by 1985 substantially all births will be first-child births.

(*b*) An increase in support of the program at high levels of government, as old-line economic administrators return to power.

(*c*) The bolstering of the bureaucratic support structure for population control, including the establishment in March 1981 of a State Family Planning Commission under the State Council, with Vice-Premier Chen Muhua as the woman in charge.

(*d*) Increased attention to the problem of guaranteed care for the aged so that fears of an unsupported old age will be lessened as a factor increasing the number of children.

(*e*) The use of technical resources to provide a variety of birth control methods to cover the range of population from sophisticated city dweller to unlettered peasant.

(*f*) A gradual coming together of individual and national goals in limiting population, as the modernization process increases the number of people economically motivated to delay marriages and have smaller families.

(*g*) The scheduling of a new census for 1982 to place demographic statistics on a firmer base.

While the goals and measures appear promising, administrators at the highest level have been tied up with problems of the political pecking order, differences over economic policy, and handling a large volume of foreign relations. Administrators at lower levels have to divide their scarce time among a host of national campaigns[15] as well as the daily details of operating a centrally planned economy. The Guandong provincial radio service quotes,[16] unfavorably, a leading bureaucrat in a prefecture who openly said: "There are so many central tasks right now, I am not quite able to handle them all. How can I find the extra time and effort to deal with planned parenthood work? It is sufficient if the planned parenthood departments handle the matter alone."

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[14] For information on Aird's series, see Appendix A.

[15] About a year ago, for example, the cadres were also pushed on campaigns to (a) curb illegal publications; (b) prevent theft of state property in factories and at the construction sites; (c) protect the environment; (d) eliminate the award of undeserved bonuses; (e) prevent illegal emigration and in-country migration; (f) conserve energy in general and fuel oil in particular; and (g) reduce industrial accidents.

[16] Beijing, Xinhua, Feb. 4, 1981, in *FBIS-CHI*, Feb. 6, 1981, L25.

Furthermore, the program must overcome the effects of the unfavorable demographic structure; 65 percent of the population is under 30 years of age, and annual cohorts of more than 30 million will be moving into the child-bearing years in the 1980's.

Finally, the slightest enthusiasm for Malthusianism continues to be bad form in official circles. A Beijing broadcast last year, for example, after noting some alarming figures on per capita amounts of land and surface water runoff, declared: "In working out statistics, we are certainly not preaching the reactionary Malthusian population theory." [17] A second recent report told of the work of two population research groups which simultaneously came up with a (supposedly non-Malthusian) figure of 700 million as the ideal size of the Chinese population 100 years from now.[18] China can use a lot of Malthusianism, even while exorcising the naughty word.

XI. Living Standards: Wanting More Now

Against a long-term background of neglect, the past three years have seen a wide range of improvements in the consumer's lot in China. Real incomes have gone up in both city and countryside. Grain output has moved above 300 kilograms per capita. Clothing is better in color and variety, and tailoring and repair services have improved. Although urban housing remains crowded, millions of families have moved into better quarters; each year roughly 5 percent of peasant families build new houses, and many others improve their housing through their own labor and local materials. The medical and educational systems have largely recovered after ten years of attacks from leftist ideologues. Consumer durables have been perhaps the brightest spot: not only have the "old important things" (wristwatches, radios, bicycles, and sewing machines) come out in greater volume but also "new important things" (TV sets, tape recorders, washing machines, and electric fans) have become available in mass volume. The authorities have encouraged individually operated vending and repair services both to increase consumer well-being and provide jobs for the 15 to 20 million unemployed urban young people.

Since the new pro-consumption policies call for more freedom in petty economic enterprise and for much greater reliance on material incentives, income will be less evenly distributed. So long as the output of consumer goods continues to rise rapidly,[19] the government authorities ought not to find this a difficult issue. More troublesome is the tendency of expectations to outrun the possibilities of fulfillment. The maintenance of social order also will require an increasing amount of resources; crime, illegal movement of people, cynicism and loss of ideological faith, and withdrawal from collective activity will probably all increase in the new plan period.

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[17] As reported in *FBIS-CHI*, May 20, 1980, P1.

[18] Beijing, Xinhua Domestic Service, Feb. 10, 1981, in *FBIS-CHI*, Feb. 11, 1981, L19.

[19] For the first quarter 1981, Beijing claimed production of 6.2 million watches (25.6 percent more than in first quarter 1980), 3.6 million bicycles (up 23.5 percent), 2.1 million sewing machines (up 22.5 percent), 9.9 million radio sets (up 91.3 percent), and 826,000 TV sets (up 87.2 percent). Xinghua, Apr. 11, 1981, as translated in *FBIS–CHI*, Apr. 13, 1981, K19.

The long-term growth rate of consumption, 3 percent per capita, should continue. GNP growth probably will drift down from its long-term level of 5–6 percent, but population growth also has been moving down. Furthermore, per capita consumption will benefit from a one-time gain of up to 10 percent as the investment and defense shares of GNP are cut.

Like other communist governments in the USSR and Eastern Europe, the Chinese have found it easier to raise money wages than to ticket additional resources for the consumer sector. In addition to major increases in the basic pay scale since Mao's death, an upward creep in workers' grade levels and wholesale grants of bonuses have boosted money wages far beyond gains in consumer goods. The result has been higher interest rates, an upsurge in urban and rural bank deposits, and attempts to stem the rise in money incomes.[20] In the meantime, the government has passed along to the consumer much of the rise in money wages and state farm procurement prices; consumer prices, according to Beijing, rose 7.1 percent in 1980.

XII. The Second Economy: Filling the Interstices

In their appraisal of the operating efficiency and growth prospects in centrally planned economic systems, economists rightly are giving increased attention to "the second economy"—all economic activity outside official channels, whether it be legal, quasi-legal, or illegal. The growth of an extensive second economy is a natural reaction to the command economy with its tautness, its lags, and its gaps. It is also a natural reaction to the monopolization of choice goods and jobs by the ruling in-group.

For China, with its vast distances and widely varying climatic and terrain conditions, the second economy helps sort out local supply and demand forces that the harried central authorities can neither comprehend nor address. Hence, the wisdom of permitting the expansion of private plots, markets, and handicrafts in the countryside and encouraging the formation of petty enterprises in the cities to furnish services and amenities outside the bureaucratic ken.[21] Individuals may draw family members into the business and, in the case of technical trades, take on one or two apprentices.

The pragmatists in charge in Beijing now recognize the potential for improving daily life by using resources that can make little alternative contribution to China's output. Retired people or youths without jobs are now urged to set up individually operated enterprises in the repair, handicraft, catering, barbering, construction, transportation, and retail trades.[22]

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[20] In March 1981, the Chinese government announced the issue of 10-year treasury bonds as an important new anti-inflationary measure. The bonds, which carry 4-percent interest, are designed to absorb the surplus funds of state and collective enterprises, government units at all levels, PLA units, and well-off rural communes and brigades. Bonds with a total value of 4 to 5 billion yuan are to be issued in 1981. For a description of the new treasury bonds, see the Xinhua domestic service broadcast, Mar. 8, 1981, as reported in *FBIS–CHI*, Mar. 9, 1981, L33–38.

[21] For a classic account of the second economy in the U.S.S.R., see Hedrick Smith, "The Russians," 1976.

[22] For a nuts-and-bolts list of small enterprises deemed suitable by the authorities in one province, see Appendix C.

A less wholesome aspect—yet in some instances an economically efficient aspect—is the use of government property for private purposes, as when well-placed officials: (a) take government cars to visit friends and relatives; (b) occupy apartments assigned on the records to somebody else; (c) throw big parties and charge them to the government; (d) arrange job assignments for relatives or confidants outside the regular labor allocation channels; and (e) accept gifts and bribes and deal through backdoor channels for scarce goods.[23]

A freer second economy in China in the 1980's will aid growth by reducing the workload of economic planners and administrators, getting production from otherwise unused resources, and improving daily life in a number of little ways. Its greatest disadvantage lies in the diversion of raw materials away from state enterprises. The authorities are trying to limit damage through a more careful licensing of individual enterprises and new regulations on the flow of raw materials—a major example of the tension between centralizing and decentralizing forces in China's economy today.

APPENDIX A. SOURCES FOR TABLES

Table 1 (China: Economic Results, 1949–80) is an updated version of Table 1 in the author's previous article for the Joint Economic Committee (JEC).[24]

Table 2 (China: Major Economic Indicators, 1949–70) is an updated version of Table 2 in the author's previous JEC articles.[25] Three years, 1978–80, have been added: the dollar figures for GNP and GNP per capita have been put in 1980 dollars through use of the U.S. GNP price deflator index: columns have been added for coal and oil output; some of the grain estimates have been changed (particularly for the lean years, 1959–61) on the basis of later information; and the latest available numbers for Robert M. Field's industrial production index have been used. The population series is the intermediate model developed by John S. Aird in the JEC–78 volume[26] and slightly modified by him on the basis of new information; the series on grain output per capita was calculated on the basis of year-end population figures. The steel, coal, and oil columns in the table are derived from Chinese data. The final column, percent trade with communist countries, is based largely on trading partner information. The piecing together of information on the Chinese economy in this table has been largely the work of analysts in the Central Intelligence Agency.

APPENDIX B. REFURBISHMENT OF THE STATISTICAL SYSTEM

The post-Mao government has lifted the highly effective statistical blackout imposed in 1960, announced the publication of an economic yearbook of 1.5 million words for July 1981,[27] and moved to correct widespread malpractices in the statistical system.

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[23] This list of illegal acts by government officials comes from a broadcast of the Jinan Provincial service, as reported in *FBIS–CHI*, Sept. 26, 1979, 06.

[24] See JEC–78, p. 207

[25] See JEC–78: p. 208 for the table; pp. 229–33 for detailed information on the construction of the simplified GNP accounts; and pp. 233–35 for sources of information on the economy.

[26] See "Population Growth in the People's Republic of China," JEC–78, pp. 439–75; the series appears on p. 465.

The national government once again publishes annual production claims for several dozen agricultural and industrial products, as well as analyses of trends in domestic trade, transportation, prices, and real wages. Provincial and local governments also have been issuing a growing volume of economic data. The drawing of China into the world economic system already has resulted in the release of more data; for example, in applying for eligibility for international assistance on favorable terms as a poor country, the PRC reported to the World Bank that its per capita income was $250.[28] Moreover, the whole modernization process requires a more open exchange of data both on the domestic front and in dealing with foreign suppliers of equipment and technology.

Sun Yefang's recent article, "Consolidate Statistical Work, Reform the Statistical System," [29] gives a blunt account of statistical malpractice over the years and suggests ways to correct the situation. Sun describes the reporting of egregiously false grain and steel figures during the Great Leap Forward, the short-lived attempts in the early 1960's to establish a politically neutral statistical system, and the dismantlement of most of the system during the Cultural Revolution. Of the latter disaster, Sun states "In those 10 chaotic years (1966–76) nearly all statistics organs at different levels throughout the country were disbanded, the staff were transferred, and large quantities of materials were burned. The statistics work of the whole country was suspended for almost 3 years (1966–69). Today, statistical offices at and above the country level still have only 76 percent as many workers as in 1965. In some countries only two or three people are handling the statistics work of the whole county, and most people's communes . . . do not have full-time statistics workers." [30] The workers in the national statistical network number 16,000 (0.16 for every 10,000 persons) compared with 220,000 in the Soviet network (8 for every 10,000 persons). Sun recommends the rapid training and hiring of large numbers of statistical workers.

Sun's article mentions specific types of statistical falsification that are still going on. [31]

a. The underreporting of births by local government units to show progress in the population control campaign.

b. The underreporting of land under civilization to show progress in meeting targets for yield per mou.

c. The omitting of various construction projects in reports to avoid criticism for lengthening the construction front.

d. The underreporting of temporary workers to avoid exceeding labor targets.

e. The underreporting of industrial output to have a cushion for unforeseen emergencies (as well as to foster easier production targets, to barter for needed supplies, and to fill the coffers of insiders); in 1979, according to Sun, 300,000 tons of "pocket oil" was not reported in eight oilfields alone.

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[27] Beijing, Xinhua, Apr. 10, 1981, as reprinted in *FBIS-CHI*, Apr. 10, 1981, K22.

[28] For a Chinese discussion of per capita GNP trends in dollars, see *Beijing Ribao*, Oct. 27, 1980, as translated in *FBIS-CHI*, Nov. 17, 1980, L24–25.

[29] Beijing, *Jingju Guanli* (*Economic Management*) in Chinese, No. 2, Feb. 15, 1981, pp. 3–5, as translated in *FBIS-CHI*, Mar. 26, 1981, L4–9. This is a gem article.

[30] *Ibid.*, L6.

[31] *Ibid.*, L8.

f. The underreporting of inventories to conceal the squirreling away of materials.

g. The failure to report price increases to obtain higher revenues illicitly.

h. The construction of incomplete indexes and material balances tables.

i. In general, the failure to report bad news at all levels, due to fear.

Statistical workers who blew the whistle on these practices promptly found themselves labeled "right deviationists," "right opportunists," and "anti-party elements." Sun puts the blame for the wildly optimistic economic plans of 1978 on the failure of the statistical system to present an accurate picture of the economic situation. He argues that statistical work in China as presently conducted cannot meet the needs of the four modernizations by a wide margin.

Sun recommends a vast increase in the size and status of the statistical system. The State Statistical Office should report directly to the State Council rather than to the State Planning Commission and—here he cites Lenin—serve as an organ of "inspection and control."[32] Sun, at a minimum, is urging a powerful auditing role for the State Statistical Office. His article reflects the efforts of the government to curb statistical fiddling; it does not, despite his ambitious recommendations, foreshadow a massive shake-up in the economic control mechanism. Once again, the government's general desire to push decisionmaking down to the operating level clashes with its desire to ensure conformity with its policies and accurate statistical reporting.

APPENDIX C: TRADES APPROPRIATE FOR INDIVIDUALLY OPERATED ENTERPRISES

The Hebei provincial government in February 1981 issued a list of trades appropriate for individually operated enterprises. These trades were identified as providing products and services of daily life that state and collective enterprises could not furnish in their entirety:[33]

A. Repair trade: repairing watches and timepieces, radios, cameras, musical instruments, electrical appliances, fountain pens, tutorial instruments, cars and vehicles, furniture, kitchen utensils, and other kinds of tools for everyday use;

B. Handicraft trade: drawing and painting, scroll mounting, engraving, paper flower making, toy making, earthern figure making, candy making, knitting, embroidery, drawnwork, iron foundry, and garment processing;

C. Catering trade: snack shops, restaurants, teahouses, bars, and cold drink shops;

D. Service trade: barbershops, bathhouses, cleaning and dyeing, shoe repair, photograph advertising design, graph and chart design, typing, carving, and seal engraving;

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[32] Ibid., L7.

[33] The list is taken without change from a Shijiazhuang Hebei Ribao report of Feb. 22, 1981, reprinted in FBIS–CHI, Mar. 17, 1981, R2–5.

E. Construction trade: drawing house plans, home maintenance, water pipe work and electrical installation, painting, and whitewashing;

F. Transportation trade: pedicab driving, cart pulling, passenger and goods transport with vehicles drawn by animals and packing, loading, unloading, and transporting work for passengers at railway stations and wharves;

G. Retail goods trade: small department stores, minor native products, metal fittings (nails, wires, hinges, bolts, and locks), sundry articles, stationery, and vegetable seeds;

H. Cultural enterprises: book and magazine stalls; and book and magazine borrowing.

APPENDIX D. BIBLIOGRAPHICAL NOTE

For the non-specialist reader, perhaps the best background book on China is John K. Fairbank, "The United States and China," Cambridge, Mass., Harvard University Press, fourth edition, 1979. The five compendia sponsored by the Joint Economic Committee of the United States Congress (in 1967, 1972, 1975, 1978, and 1981) serve as useful sources of information and judgments on the Chinese economy as a whole and its main sectors. More detailed and specialized articles can be found in The China Quarterly (School of Oriental and African Studies, London University), which also lists the newly published books and articles on the economy. The reader's best bet for current coverage of the Chinese economy is the Daily Report, China, of the Foreign Broadcast Information Service, available in major libraries or from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22151; this publication provides translations of a wide variety of information on Chinese economic plans and results, economic administration, foreign economic relations, and economic commentary by visitors and other foreign observers.

REFORM IN CHINESE INDUSTRIAL MANAGEMENT: AN EMPIRICAL REPORT

By Bruce L. Reynolds*

ECONOMIC REFORM IN CHINESE INDUSTRY

In the two years after December 1978, the People's Republic of China initiated a broad set of economic reforms. In December 1980, industrial reforms came to at least a temporary halt. This paper reviews reform within the industrial sector. My conclusions are as follows. First, reform in industry has been quite limited. The Chinese industrial enterprise today remains more tightly bound within a web of bureaucratic central planning than in most Eastern European countries.[1] Second, and consequently, the reforms to date will not generate the sustained rise in factor productivity which was their objective. The obstacles to reform are considerable, but they are technical and bureaucratic more than ideological; while reform itself is becalmed, proponents of reform show no signs of drawing back from what (in pre-1977 terms) are radical positions. If they succeed in keeping reform on the agenda, a time may come when the need for greater efficiency and productivity in industry will precipitate renewed implementation of reforms. According to the leadership's timetable, that day will not come before 1985. However, unsatisfactory industrial growth could foreshorten that schedule.

Why is reform important? First, it provides a window through which we can watch Chinese policymakers grappling with a severe social problem: stagnant productivity and sluggish technological change. From the experience of Russia and Eastern Europe, we know well the nature and intractability of this problem. Second, true reform would fundamentally change the way Chinese industry functions. The change would increase the growth rates of factor productivity and of GNP. A more rapidly growing China would be a more attractive trading partner and a more stable member of the world community. Third, true economic reform—that is, dispersion of economic power to production units themselves—is a necessary condition for political pluralism. As long as government in China has the power to control the production and distribution of the necessities of life, the regional pattern of investment, and the destinies of hundreds of thousands of managers, the growth of political freedom will be constrained.

This paper excludes important issues. Most notably, it ignores agriculture, where reform has proceeded faster than in industry. True reform, as I shall use the term, does two things: it vests important economic powers in basic-level producing units, and it uses prices and

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[1] This comment, and indeed this entire paper, deals only with the 80,000 or so large enterprises which form the core of Chinese industry and produces 75% of industrial output. China has several hundred thousand small-scale urban factories, and over a million small-scale rural factories. These factories are not tightly controlled; they swim in the interstices of the planning system.

markets to coordinate production. On both these scores, the task is easier in agriculture than in industry. Agricultural land in China is not as completely socialized as industrial capital—it is owned by production teams, not by the state. Logically, socialization is easier to reverse where it has not proceeded so far. And prices in agriculture are much more amenable to central manipulation than in industry, because the products are more homogeneous and the linkages among products are less complex.

The paper also excludes reform in the foreign trade system. Broadly speaking, most of the State Council decrees for expanded powers to exporting enterprises were never implemented, principally due to resistance within the Ministry of Foreign Trade. Some decentralization of power to the provincial level remains, notably in Fujian and Guangdong Provinces.

Another important omission is change in intra-enterprise administration (I will deal only with inter-enterprise relationships). Here two issues stand out. First, have reforms linked the income of an individual worker to his performance on the job? Generally speaking, no. The reforms created an enterprise bonus fund which is loosely linked to performance and profit. But the distribution of that bonus fund within the enterprise is not based on individual effort. Second, will the intra-enterprise power structure be changed? Some Chinese writers warn that surrendering central power to enterprises will create a class of autocratic managers. They want to place ultimate authority in the hands of workers' congresses (under the leadership of the enterprise Party Committee). Although some regulations along these lines were passed in July 1981, I expect implementation to be slow.

Finally, space does not permit me to place the Chinese reforms in an appropriate temporal and spatial context. One would wish to review the reform debate in China from the mid-1950s on, to show that the reform proposals, and indeed many of the devices used, have a history which lends them stability and momentum.[2] One would also wish to compare the Chinese reforms with reforms in Eastern Europe and the U.S.S.R. Similarities abound. For example, the reef upon which the Chinese reforms have at least temporarily foundered is familiar to Eastern European reformers: the (somehow!) unexpected appearance of inflationary pressures.

These exclusions still leave an ample agenda. Section I documents the pressures impelling the Chinese toward reform. Section II reviews the pre-reform system of enterprise management, and the reform proposals of Xue Muqiao and others. Section III argues that only a part of Xue's proposals were preserved in the reform directives of the State Council in 1979 and 1980, and Section IV suggests that even those directives were incompletely implemented. Section V reviews the obstacles which have hindered a fuller reform, and considers the prospects of further reform in the future.

I. Industrial Reform and Economic Growth

China must reform in order to maintain an acceptable rate of economic growth. Economists distinguish two sorts of growth: extensive growth (achieved by adding to the stock of labor, capital and other productive factors) and intensive growth (achieved by raising the productivity of the existing stock of productive factors). Growth in developed countries over the past hundred years has drawn about equally from both sources.

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[2] A forthcoming article by Dorothy Solinger, in Asian Survey, provides an excellent review of the earlier roots of current economic policy.

Chinese central planning has been enormously successful in generating extensive growth in industry. Expropriation of income from capital and land, and government control of the terms of trade between industry and agriculture, made it possible to raise the rate of saving from a pre-war level below 10 percent to greater than 20 percent in the 1950s. The capital thus accumulated was invested in industry, through industrial and infrastructural projects whose large scale particularly suited them to central government control. With an industrial growth rate exceeding 10 percent per year, China rapidly built up a large and comprehensive industrial structure. Her per capita growth rate of 2.7 percent (1959–79) compares very favorably to the 1.6 percent rate from all other low-income countries during that period.[3]

But China's strength in this area conceals her grave weakness in generating intensive growth (or technological change). Intensive growth flows from millions of unrelated decisions by basic producing units—millions of independent producers finding better ways to work. The same centralization which enabled China to shift resources from agriculture to industry, and to use effectively the existing pool of foreign industrial technology, stripped those basic-level units of power to improve the production process, and eroded the incentive for them to do so. In a system where central control deprives an enterprise of the power to strike out on its own, the center cannot reasonably require that enterprise to sink or swim—to raise efficiency or suffer the consequences. The systemic obstacles to technological change which Joseph Berliner has documented in the U.S.S.R. hold with equal strength for China.[4] The result: in China, the annual increase in labor productivity since the 1950s has been a miniscule 0.3 percent, less than one-third the rate in other low-income countries—and even this low growth rate has required very substantial growth in capital per worker.[5]

In the 1970s, to cling to an intensive growth strategy became increasingly costly to the Chinese, in two senses. First, it became increasingly difficult to translate capital accumulation into GNP growth. In the first five-year plan period (1953–1957), $100 of investment increased GNP by $59. In the fourth five-year plan (1971–1975), this had fallen to $27.[6] Thus, to sustain high GNP growth required that an increasing share of GNP be devoted to investment—by 1978, well over 30 percent. A second, more subtle cost of China's extensive growth strategy is the growing opportunity cost of foregone intensive growth. In the 1950's, the industrial sector was small. Even if productivity and technology stagnated in existing factories, this was an acceptable price to pay for rapid extensive growth. But today, there are 100 factories for every 5 in 1950.[7] In the absence of any pressure to modernize, the technology in use in these enterprises is 1950s or 1960s vintage—the period in which they were built. This failure of the past represents a future potential: a new industrial structure conducive to intensive growth might stimulate very rapid growth in productivity in these plants.

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[3] World Bank. Report on China, cited in Economist, 2 June 1981 p. 34.

[4] Joseph Berliner, "The Innovation Decision in Soviet Industry" (Cambridge, Mass: MIT Press, 1976).

[5] World Bank, *opus cit.*

[6] Renmin Ribao (People's Daily, henceforth RMRB), 2 March 1981, p. 5.

Chinese academics began to suggest a transition to intensive growth in industry as early as the late 1950s.[8] But in the initial post-Mao period, China instead reinstituted the highly centralized system which had served so well during the 1950s.[9] Once again, complete-plant imports played a central role. But unlike the 1950s, the inflow of foreign technology was enormous (because the Chinese industrial sector was now so large), while the planning system was, if anything, less competent than twenty years before. Huge central government ambitions led, predictably, to huge central government errors, culminating in a buying spree in late 1978 which has left white elephants like the Baoshan Iron and Steel Complex strewn like derelicts around the landscape.[10] As these excesses became known, an effective constituency for fundamental reform finally evolved, beginning with the Third Plenum of the 11th Party Congress in December 1978.

The policy which emerged from the Third Plenum had many components. We will focus on just one: expansion of the decision-making powers of industrial enterprises. We will consider that policy from three perspectives: first, academic reform proposals; second, State Council regulations; and third, implementation of the new regulations.

II. THE TRADITIONAL CHINESE ENTERPRISE AND REFORM PROPOSALS

During the 1950s, the Chinese enterprise acquired all the familiar features of central economic planning.[11] An annual production plan, set by a superior bureau or ministry, embodies the output mix, total output, labor force, and other basic production decisions. Relations with other enterprises—suppliers of inputs, purchasers of output—are midwifed by a "unified supply and distribution" system. Whereas in a market economy, supply and demand are balanced through the independent activities of many buyers and sellers, coordinated by the price fluctuations which their actions generate, the Chinese adopted the Russian technique of material balances: government bureaus aggregate demand and supply, and ration out scarce goods according to government-determined priorities.

This system generates numerous inefficiencies. As it attempts to balance supply and demand for hundreds of thousands of goods, the center naturally aggregates information. Details about product specifications are necessarily suppressed in the aggregation process. Once lost, this information is rarely recovered. As a result, the wrong goods get produced, or if produced, often go to the wrong user. Thus even when "balance" is achieved at a macro level, at the micro level many enterprises are short of key inputs, and must therefore produce below full capacity. To avoid this, enterprises commonly overpurchase inputs, resulting in wastefully large inventories.

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[7] Liang Wensen, "Gaige guding zichan de guanli shidu" (Reform the management system in fixed capital), in Liu Guoguang, ed., "Guomin jingji guanli tizhi gaige de ruogan lilun wenti" (Some theoretical problems in the reform of the national economic management system) (Beijing: 1980), p. 156, states that capital stock increased 21 times over this period.

[8] See for example Liu Guoguang, "Shehui zhui zaishengchan wenti" (The Problem of reproduction under socialism), a set of essays from the early 1960s, republished in Beijing in 1980.

[9] The most vivid single example of this policy is the 17,000 word policy review by the State Planning Commission, published in RMRB, 9 October 1977, p. 1.

[10] For a detailed and not at all sympathetic description of the buying spree, see "Lessons from twenty-two complete plant purchases", in Jingji Guanli (Economic Management) VI (June 1981) p. 21. See also article by Martin Weil in this volume.

[11] Industrial planning in this period is described in Bruce Reynolds, "The Sinicization of Soviet Planning in the Chinese First Five-Year Plan", paper presented at Stanford University, December 1978.

More serious still, the system provides few incentives to an enterprise to raise productivity and reduce cost. The enterprise in a market economy has one paramount target: profit. Increasing productivity increases profits. The Chinese enterprise, although formally committed to profit, cost, and many other targets, in practice places very heavy emphasis on one target: value of output. Within the terms of its incentive structure, an improvement in the production process which would lower cost, raising profit but leaving output unchanged, is less attractive than a change which raises output, at the cost of a disproportional increase in cost and a decrease in profit.

Even if the planning system provided an incentive to search out more efficient production processes, the system deprives the enterprise of the funds needed to implement such changes. Even depreciation funds—that is, money earmarked for replacement investment—are outside the control of the enterprise. In the 1950s, all depreciation funds were remitted to the center. In that period, such a system made some sense. Due to the very rapid increase in the capital stock in those years, most equipment was new, and little replacement investment was required. But the system stuck (with some revisions after 1967): in 1978, according to one estimate, roughly 90 percent of depreciation funds ended up in central or local government hands.[12] The result of the overcentralized control is that less money is spent on replacement investment in existing enterprises than is economically desirable. And those funds which are spent on replacement investment come to the enterprise in the form of categorical grants.[13]

The late 1970s, then, found Chinese enterprises more rigidly controlled than in any other socialist country—certainly more so than in the USSR. As one member of the State Planning Commission commented, "After the Sino-Soviet break, anything the Russians did was revisionism. So they implemented a number of reforms—but we could not adapt these for use in China." [14] It does not greatly stretch the truth to say that the Chinese enterprise today is not a decision-making unit.[15]

Setting aside for the moment the reforms which the State Council enacted in 1979, and their implementation, let us first juxtapose to this picture of tight central control the image of a post-reform enterprise as we encounter it in the reform proposals of Chinese economists in recent years. These proposals cover a wide spectrum. I will synthesize the views of Xue Muqiao.[16] Xue was a vice-chairman of the State Planning Commission and head of the State Statistical Bureau in the 1950s, and the first director of the National Price Commission in the 1960s. He is currently senior adviser to the State Planning Commission. Articles under his name appear weekly in People's Daily and major journals. His book, "China's Socialist Economy," is one of the very few works on any subject to have been translated into English. With the possible exception of Chen Yun, Xue clearly dominates the discussion of economic reform.

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[12] Liang Wensen, *opus cit.* p. 1972.

[13] For example, in 1979, the total of 2.6 billion yuan made available to Shanghai enterprises for replacement investment was dispersed over 26 different categories.

[14] This statement comes from private conversations in Beijing in the first half of 1981. The same holds for one or two other assertions in this paper which one would ordinarily wish to document more precisely.

[15] Again, I do not mean to include here small-scale collective enterprises.

Xue's reform proposals are clearly radical, implying a fundamental move away from strong central planning. For most enterprises, he would abolish mandatory annual production plans. His reformed enterprise would be financially independent, paying taxes to the government and bearing the full impact of any profit or loss from its operations. The system of central government procurement, materials balancing and distribution, would be restricted to a few vital, homogenous commodities such as coal, cotton and sugar. For the rest, he would let market demand dictate the production mix, by linking producing enterprises directly to the market. "Rather than letting the production plan determine sales on the market, we should let market needs determine the production plan." State intervention in such an economy would come mainly through parametric levers, such as prices, taxes and interest rates, applied uniformly to all enterprises. Where these failed to bring production into line with planners' preferences, the center would use its control over key materials, over investment flows, and over bank credit.

Xue writes in general terms. I suspect that were he to spell his proposals out, they would appear somewhat less liberal. A recent article by two authoritative economists at Beijing University may well reflect such a fleshed-out program.[17] They would reserve a broad range of powers to the planning sphere. The government would determine the rate of saving and investment, the distribution of investment between agriculture, light industry and heavy industry, and the sectoral distribution within heavy industry. The state would also balance (i.e., control and, if necessary, ration) finance, credit, foreign exchange and key materials, and would play a major role in manpower planning. The state would set "precise targets" on an annual basis for national output of major industrial and agricultural products, and "send down relatively mandatory targets" to the "major backbone enterprises." The state would also approve major construction projects, allocate major materials, and determine the national wage bill. Even in this version, administrative intervention by the state is mild compared with current practice.

Elsewhere in the literature one finds yet more liberal programs. One well-known author proposes that enterprises become "relatively independent producers", with control over their own labor force, finance, production, supply and marketing, and retaining all after-tax profits. The state plan would operate only in the intermediate and long term. Here, there are no "backbone enterprises" still subject to direct planning, or "key materials" still centrally allocated. The central planning apparatus survives only in the single escape clause: "The state will also retain the necessary administrative means to control and coordinate the economic activities of complexes and enterprises."[18] Balancing this liberal vision, we find an authority from within the State Economic Commission (which, under Chen Yun, seems less reform-oriented than Xue and the SPC), saying that control over key materials during the 1970s was "insufficiently centralized", and that direct central government control over key enterprises should be extended, to the pre-Cultural Revolution level. Here "reform" seems to amount only to the creation of very large industrial complexes, which would have substantial powers over internal resource reallocation but would interact with each other through the traditional planning system, rather than through the market.[19]

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[16] For two good English-language expositions, see "China's Socialist Economy" (Beijing: Foreign Languages Press, 1981), and RMRB 15 June 1979 in Foreign Broadcast Information Service 20 June 1979 p. L19.

[17] Wang Yongzhi and Kao Chengde. "Lun chonge pingheng yu jingji guanli tizhi" (Discussion of comprehensive balance and the economic management system) Jingji Kexue (Economic Science) 2:1981 (May 1981) p. 22.

Even if the old, administered economy lurks in the shadows of some of these reform proposals, they are nonetheless light-years advanced over the level of discourse prior to 1977. Nothing more clearly signals this change than the acceptance of profit as the best index of enterprise performance. In a typical statement, we are told that the ratio of profit to fixed plus working capital is a more rational indicator than gross value of output, because "profit is the manifestation in currency of surplus product—of the economic results after deducting production costs; it reflects in a rather comprehensive way the enterprise's conservation of embodied and living labor, its improvement in management and its increase in effectiveness of investment."[20]

Despite this acceptance of the "profit test", one glaring omission gives the Chinese reform literature an unreal quality. These writers wax eloquent over the regulatory role of the market while rarely if ever discussing prices and the price system. To Western economists, the market for a good is defined in terms of the price which prevails therein. When Chinese economists propose expanding the "role of the market", they mean reforms which permit enterprises to deal directly with each other, instead of interacting through a central planning bureaucracy. But these contacts can be termed "market interaction" only if the interaction is based on price, and in turn influences price. The Chinese literature ignores the role of prices, and the source of prices, in the new system.

III. Reform Directives, 1979–80

The Third CCP Plenum in December 1978 called on the government to "let localities and enterprises have even more powers of self-management, under the unified leadership of the state plan." Beginning in 1979, growing numbers of "experimental enterprises", notably in Sichuan, began to operate under new, provincial reform directives.

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[18] Liu Guoguang, "Reforming China's Economy: Problems and Prospects", lecture delivered at Oxford University, April 1981.

[19] Private communication.

[20] Zhang Weida, "Shengechan jiage yu jingpi tizhi gaige" (Production prices and reform of the economic system), in "Shehui zhui zhidu xia jiage xingcheng wenti" (Problems of price information under the socialist system) (Hunan: 1980), p. 78.

In July 1979, a set of State Council directives supplemented these local systems.[21]

These reform directives had two analytically distinct effects. First, they gave enterprises new decision-making powers. Second, they constructed a new incentive system. The new powers, over the current production process and over investment, sought to eliminate some of the inefficiencies described in Section II. The incentive structure would hopefully ensure that these new powers would be used in conformity with broad social purposes, as reflected in enterprise profits. I will look first at the Sichuan decrees (the "14 Articles"), and then at the national decrees of July 1979 and later.[22]

What new powers did enterprises receive under the Sichuan 14 Articles? Regarding investment, there was a significant increase in enterprise funds. The proportion of depreciation funds retained by the enterprise rose from 40 to 60 percent (though the annual base remained an unrealistic 4 percent of total capital stock). More important, funds for renovation and expansion, which were previously fixed and controlled from above, would now be based on the enterprise's profit retention (see below), and controlled by the enterprise. Regarding powers over current production, the picture is necessarily more complex. Under the 14 Articles, a proportion of the enterprise's annual production plan could be determined by the enterprise itself. This output was no longer to be surrendered to central supply units, but could be sold by the enterprise itself through a variety of new trade channels, including direct inter-enterprise sales. For some goods (those in excess supply), enterprises could reduce prices to stimulate sales, as long as the selling price did not fall below production cost. Enterprises could also obtain inputs directly, rather than depending on central supply units. To facilitate this process, some producer goods—for example, steel plate—would in part be distributed through the market.

How was the enterprise's incentive structure reshaped by the 14 Articles? Broadly speaking, the new decrees made profits the key enterprise objective. Previously, profit had been one of four or eight enterprise success indicators. This gave enterprises no more than a moderate interest in fulfilling their target for planned profit, and no interest in above-plan profit. Under the 14 Articles, profit became the source of an enterprise fund, determined in the following manner: 5 percent of planned profit, plus either 15, 20 or 25 percent of profit in excess of the previous year's level. These retained profits were to be used in three ways: first, to renovate and expand production capacity; second, for worker welfare (dormitories, canteens, nurseries etc.); and third, to provide cash bonuses to workers (not to exceed 17 percent of the wage fund). Subject to the limit on bonuses, the distribution of retained profits among these three categories was to be determined by the enterprise itself.

In April 1979, a central work conference evaluated the experience of the enterprises which had been experimenting with these new powers in the various provinces. In July, the State Council issued five sets of directives on economic reform, paralleling the earlier local provisions.[23] How did these central government directives differ from the 14 Articles? Concerning investment powers, the State Council provisions allowed for 70 percent retention of depreciation funds by enterprises. The depreciation schedule was accelerated, at rates to be determined in later regulations. The July language stipulated, however, that accelerated depreciation would be determined on an industry-by-industry and even enterprise-by-enterprise basis, and would be linked to increased profits. Enterprises would have access, as under the 14 Articles, to production development funds financed through retained profits. These new funds, the State Council noted, merely replaced state funding for basic construction; the latter would be correspondingly reduced. Thus the picture is mixed. Despite the promise of 70 percent depreciation retention and accelerated schedules, some Chinese authors argued that enterprise power over investment had been reduced compared with the 14 Articles; indeed, they complained that this went against specific assurances by Premier Zhao Zhiyang. In particular, Sichuan permitted an enterprise which developed a new process or product to plough back all the resulting profits into capacity expansion for a period of two years; the State Council documents omit this provision.

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[21] A number of important directives on economic reform have been published in "Guowuyuan Gongbao" (State Council Reports), an occasional publication henceforth cited as SCR. The July directives, which to the best of my knowledge have not been published, are henceforth cited as SC (13 July 1979). The Sichuan 14 Articles and 12 Articles have also not been published.

[22] I would like here to acknowledge gratefully my considerable debt to Prof. Audrey Donnithorne, who generously made available to me some of the fruits of her visit to Sichuan Province in the summer of 1980.

Enterprises were also granted new powers over current production, paralleling the 14 Articles but somewhat more restrictive. Subject to completion of the state's production plan, enterprises could set a "supplementary plan". Output under this plan would not automatically be purchased by the state. It would first be made available for "selective purchase" (xuangou) by the Ministries of Commerce and Foreign Trade and the State Materials Supply Bureau. Only then could enterprises sell directly (or through the trading networks on a consignment basis). Concerning possible price reductions to facilitate sales, or direct acquisition of key inputs through the market, the State Council provisions are mute (although some relaxations in these areas did in fact occur).

The July State Council directives also revised the incentive structure of the 14 Articles. Under the 14 Articles, an enterprise's profit retention depended in part on the excess of this year's over last year's profit—a "surplus profit" (chao e) system.[24] The July directives simplified this system: current year retained profit would be a set proportion of current year total profit—a "total profit" (quan e) system. (This revision actually paralleled the new "12 Articles" already in use in Sichuan for some enterprises). Compared with the total profit system, the surplus profit system created a very strong incentive to achieve the planned profit target. In addition, a profit shortfall reduced retained profit more than it reduced remitted profit. On the other hand, the total profit system had the merit of simplicity: an enterprise saw clearly where it stood, and was less likely to play games with the system, trying, for example, to hold profit low in the current year in order to garner 15–25 percent of a very large increase in profit in the subsequent year.

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[23] The most important of SC (13 July 1979) for this paper are the following: "Guanyü kuoda guoying gongye qiye jingying guanli zizhuquan de ruogan guiding" (Several regulations concerning expanding the managerial autonomy of state industrial enterprises); "Guanyü guoying qiye lirun liucheng banfa de guiding" (Regulations on the method of profit retention in state enterprises); "Guanyü tigao guoying gongye qiye guding zichan zhejiulü he gaijin zhejiu fei shiyong banfa de guiding" (Regulations on raising the depreciation rate on fixed capital and on improving the use of depreciation funds in state industrial enterprises).

[24] Actually, the 14 Articles used current year planned profit, rather than past year realized profit, as the basis. But the 14 Articles also stipulated that current year planned profit should always be set equal to past year actual profit. To simplify this discussion, I have assumed that this equality always holds; in practice, planners very probably often violated the directive and set planned profit on other bases.

In principle, these reform provisions gave enterprises the power, within some limits, to set their sights on profit, and by linking profit to bonuses, welfare and plant expansion, left them eager to do so. In practice, incomplete and inconsistent implementation robbed the reforms of most of their force.

IV. IMPLEMENTATION, 1979–81

Reform began first in Sichuan Province, where now-Premier Zhao Zhiyang was then party secretary. Six Sichuan enterprises moved to the 14 Articles system in October 1978. This figure rose to 100 in early 1979, and 417 in 1980.[25] In the 84 experimental enterprises in Sichuan which were locally controlled, total profit and remitted profit in 1979 rose 33 percent and 24 percent respectively. In 1980, when remitted profit for all local enterprises combined fell 7.6 percent, the decline was only 3.7 percent in experimental enterprises (vs. 30.3 percent for other local enterprises).[26]

Experiments began elsewhere in early 1979. Yunnan Province, for example, placed 50 enterprises on the new system in early 1979, and another 50 by year's end.[27] For the country as a whole, there were 4000 experimental enterprises by the end of 1979, and 6600 as of July 1980. These represented 16 percent of all enterprises entering into the state budget, and 60 percent and 70 percent respectively of industrial output value and profit. In Shanghai and Tienjin, experimental enterprises accounted for 80 percent of industrial output; in Beijing, 94 percent.[28]

By late 1980, then, a reformer might reflect with pleasure that the new system encompassed the heart of the Chinese industrial sector. Those enterprises not yet converted to the profit-retention system were either the large number of very small enterprises, or those whose low (or negative) profits made application of the new incentive system impossible. Reformed enterprises seemed to be stimulated to raise profits, to both their own and the Ministry of Finance's benefit. Reform boosters could also argue that the change had been cheaply bought. Overall profit retention ratios were low—averaging 11.4 percent in Yunnan in 1979, and below 20 percent in 1980 in Sichuan enterprises. Of retained profit, over 80 percent went for enterprise capacity expansion or worker welfare.[29] Since these two categories covered spending which would otherwise have had to come from the central budget, one could argue that the experimental enterprises actually retained only that part of profits which went to cash bonuses. According to this method of reckoning, of the increase in profit in experimental enterprises in the nation as a whole, the government appropriated three-fifths, and the enterprises retained only two-fifths.[30] But these frequently seen arguments do not stand up well to closer scrutiny. Since only relatively profitable and well-managed enterprises were inducted into the reform system, it would have been astonishing if their profit performance had been below average. And on a cash flow basis, 90 percent of increased profit remained with the experimental enterprises, and only 10 percent flowed to the Ministry of Finance.[31]

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[25] Liu Guoguang, April 1981, *opus cit.*
[26] Jingji Guanli, June 1981, p. 20.
[27] Jingji Wenti Tansuo, January 1980, p. 40.
[28] SCR 1980 No. 14 (20 November 1980), p. 419.
[29] Jingji Wenti Tansuo, January 1980, p. 46.

The rapid spread of reform in industry, rather than a sign of success, suggests to one familar with Eastern European reforms that the change cannot have been radical; and indeed, it was not. The remainder of this section will document the limitations of the reform as implemented. We will deal first with limitations in decision-making power, and then with weaknesses in the profit-based incentive structure.

To what extent did Chinese enterprises gain control over investment funds? Although the evidence is mixed, a few aggregate figures suggest that change in this area was greater than in production planning. This is surprising. Production decisions affect only one year's output. The repercussions of an investment decision, on the other hand, last for the lifetime of the new machine. One would therefore expect the central authorities to be especially reluctant to surrender investment power to enterprises. (In Yugoslavia, for example, current production decisions were decentralized early in the 1950s, but investment power was not centralized until the 1960s.) Yet in China, relaxation over investment funds was considerable. Enterprises were able to pool investable funds from previously-separate categories: the newly enlarged depreciation funds, the portion of retained profit earmarked for expanding production, and the major repairs fund. Sichuan enterprises were also permitted to retain and reinvest, for the first two years, 100 percent of the profit flowing from self-financed investment. In 1979, these sources generated 150 million yuan in investable funds among the 84 locally-controlled experimental enterprises—termed "an impressive figure."[32] Nationally, under 1980 regulations, the pool of investable funds retained by enterprises was approximately 15 billion yuan.[33] This figure is easily 50 percent of total gross investment in industry in 1980. If correct, it represents a significant loosening of the system.

In the area of production planning, on the other hand, the reduction in central control is far less than meets the eye. The July 1979 directives suggest that Chinese enterprises can set a "supplemental" production plan of their own, buy the necessary inputs on the market, and sell the output themselves. But which enterprises have been permitted to set supplemental production plans? Those whose products are in such excess supply that the state cannot dispose of the output. China is currently shifting her production mix away from producer goods and toward consumer goods. This shift means that a large part of heavy industry—especially metallurgy, machine tools and chemicals—has excess capacity. Since 1979, the state has told enterprises in these industries, "Our production plan this year will occupy only 50 percent (or 30 percent or 80 percent) of your capacity. We will buy only that output. You are free to use the rest of your capacity as you wish, but you will have to find your own buyers for the output." As part of the readjustment process, such a policy makes good sense. But this sort of 'freedom' is akin to the freedom of a castaway sailor to swim for himself: he would doubtless rather be back aboard ship. And there is a further catch: the state provides inputs only for goods covered by its own production plan. For the 'supplemental plan', the enterprise must purchase its own supplies on the market. To understand why this, too, is a 'freedom' of dubious value, we must understand the way in which the Chinese materials supply system operates.

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[30] SCR No. 14 1980 (20 November 1980), p. 419.

[31] Assuming that bonus payments were consistently 20 percent of total retained profits.

[32] "Sichaun kuoda qiye zizhuquan shidian jingyan" (Trial experience in expanding enterprise autonomy in Sichuan) (Sichuan December 1980), p. 61.

[33] Liu Qiingu. "Yao jiaqiang dui qiye ziyou zijin shiyong de zhidao" (We must appropriately strengthen guidance over discretionary enterprise funds), Jingji Guanli, June 1981 p. 37.

Materials supply planning is the heart of annual planning, and the key instrument through which the center exercises short-run control over the industrial sector.[34] During the first five-year plan, the Chinese duplicated the Soviet system for controlling the flow of key materials.[35] They divided goods into three categories: (1) balanced (i.e., allocated) by the State Council and the State Planning Commission; (2) balanced by the central ministries; (3) balanced by local governments. The single factor most likely to mark a good for inclusion in categories 1 and 2 is scarcity—that is, one should expect that every bottleneck input, every input which critically constrains an enterprise's ability to produce, falls therein. By 1957, 45 percent of industrial output fell into categories 1 and 2. In 1981, despite earlier plans for reform, this system is still fully in force, and categories 1 and 2 account for roughly 50 percent of industrial output value.

Now, what proportion of category 1 and 2 goods flow onto the market, where an enterprise with a "supplemental production plan" could purchase them? Even in Sichuan Province, the heartland of economic reform, category 1 and 2 goods can enter the market only if they are part of an enterprise's supplemental plan output. For all goods, supplemental-plan output in Sichuan was 10 percent of the total in 1979, and 20 percent in 1980.[36] These are modest figures to begin with—and as we have seen, the goods in question are "excess-supply" goods—those least likely to constitute a critical bottleneck for an enterprise trying to function on its own.

This argument amounts to saying that key inputs can't be available on the market because they aren't produced, in significant quantities, under supplemental plans. A more direct test is simply to ask: what is the magnitude of the flow of category 1 and 2 goods through the market? The largest single "market" outlet of category 1 and 2 goods in Sichuan is the Sichuan Production Materials Corporation, in Chengdu. Any enterprise can buy its goods, at state-set prices, for cash, without a planned allocation. In 1981, this corporation expects turnover to be 20 million yuan. The corporation estimates 1981 distribution of category 1 and 2 goods in Sichuan, by planned allocation and market combined, at 40–50 billion yuan, with the market accounting for roughly 10 percent of that total. The corporation confirmed that it sold only the above-plan output of enterprises, and that these goods were typically not those in short supply.[37]

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[34] This central insight, like many others, I owe to Alexander Eckstein.
[35] This system is described in Bruce Reynolds, "Two Modes of Agricultural Development: A Context for Chinese Economic Policy", China Quarterly, December 1978.
[36] Jingji Guanli, June 1981, p. 19.

Thus it seems fair to say that the unified distribution system, under the materials supply bureaus at every level, still dominates the process of procuring key inputs in China. This is not to deny that some things have changed. Some category 1 and 2 goods are now freely bought and sold, and category 3 goods distribution has also been relaxed. But the changes are not radical. Indeed, they are supplementary measures associated with the readjustment, not the first step toward a free market in producer goods.

What of the implementation of the new incentive structures described earlier? In many ways, the incentive structure is the core of an economic reform. If incentives are strong enough, an enterprise may overcome limitations in decision-making powers. Even if certain inputs can't legitimately be obtained except "through channels", a well-motivated enterprise may nonetheless contrive to get them. By the same token, an enterprise with no strong motivation may not make use of new powers, no matter how generous those powers may be. In the Chinese case, a succession of revisions in the regulations governing profit retention, coupled with inconsistent implementation of those regulations, has left an atmosphere of uncertainty which badly erodes the effectiveness of the profit link. Even so, compared with the situation prior to 1976, a strong link to profit now exists.

China experimented in the space of only two years with four different arrangements governing enterprise finances. In 1978, an enterprise fund was created, amounting to 11 percent of each enterprise's total wage bill. From this amount, the enterprise could pay for expanding production, worker welfare, and worker bonuses. This system gave the enterprise some limited new financial powers, but created no incentive to increase profit. Then came the Sichuan 14 Articles, under which

$$\text{retained profit}_t = aP_{t-1} + b(P_t - P_{t-1})$$

where b exceeds a, and P stands for profit.[38] Here, perhaps one-quarter to one-third of retained profits flows from the current year's increase over the previous year; hence the name, "surplus profit system" (hereafter SPS). As we have seen, during 1979, a number of "experimental enterprises" were placed under this system, with the rest remaining under the enterprise fund system.

Then during 1979, Sichuan developed a new, "12 Articles" system, which was incorporated in the July State Council directives. Here,

$$\text{retained profit}_t = cP_t$$

Retained profit hinges exclusively on total profit in the current year; hence the name, total profit system (TPS). This system is suitable for enterprises whose profits are relatively stable, due to stable external conditions. A number of enterprises meeting this condition began under the TPS system in 1980.

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[37] Interview conducted in July 1981.

[38] For fuller discussion of this system, see various articles in "Disanci chuanguo caizheng lilun taolunhui wenxuan" (Selected articles from the third national discussion meeting on financial theory) (Beijing, October 1980).

Fourth and most advanced is the system of "replacing profit remission with tax payments", also called "own responsibility for profit and loss" (zifu yingkui). Under this system, an enterprise would pay various taxes, including two (a revenue-equalizing tax and an income tax) to which other state-owned enterprises are not subject. All profit net of these taxes would be retained by the enterprise. In 1981, only 270 enterprises, including 10 in Sichuan, had adopted this system.[38]

These four systems represent points along a continuum of risk and reward. Under the enterprise fund system, the enterprise's bonus and other discretionary funds were risk-free; secure from the influence of a shortfall in profit. On the other hand, higher profit brought no reward to the enterprise. At the opposite extreme, an enterprise operating under the tax-linked system faced the possibility of zero discretionary funds if profits were zero, but garnered all the benefit of non-zero profit The debate in the past two year has focused on the intermediate systems, SPS and TPS. Let us look at these in more detail.

Consider the retention ratios a, b and c. The reform directives provided that these should be set, enterprise by enterprise, in such a way as to generate a target amount of retained profit—an amount equal to previous enterprise spending in the three categories: production expansion, worker welfare and bonuses. But the formulas include future profits, and future profit is uncertain. SPS and TPS treat the risk flowing from this uncertainty in different ways. SPS provides perhaps two-thirds of retained profits through the first term, aP_{t-1}. This is a known quantity when a is set. Thus SPS provides a floor below which retained profit cannot fall; TPS does not. But the inevitable corollary is that b exceeds c—i.e., small profit shortfalls will be more sharply penalized under SPS than TPS. Thus an enterprise which feels very uncertain about the level of future profit, and which is risk-averse, will prefer SPS, with its safety net; and the Ministry of Finance will prefer it as well. But an enterprise which feels sure that realized profit will fall somewhere near expectations (and which is risk-averse) will prefer TPS.

This analysis suggests that SPS is a stepping-stone to TPS. It is a system appropriate to the confused period of readjustment and early reform, when profit levels are unpredictable, but one which would later give way to TPS (and eventually to the tax-based system). It appears that China anticipated just this sort of progression. The 14 Articles, using SPS, gave way to the 12 Articles and the July 1979 directives, using TPS, and to a few experiments with tax-based finances. But in March 1980, the July 1979 directives were revised, and the incentive structure reverted to SPS.[39] Many enterprises never began the TPS system at all. Most enterprises now are operating either under the enterprise fund system, or the SPS system (or a mixture of the two, in which

aP_{t-1} is replaced by $a\overline{W}_t$, where $\overline{W}_t$ = total planned wage payments.) Why the backsliding to SPS? The Ministry of Finance took a strong position, refusing to guarantee the year's planned level of profit remission unless SPS were used. SPS does provide a much sharper incentive than TPS to produce the final few percentage points of planned profit. But as implemented, it also is much more likely to generate dysfunctional "gamesmanship" between the enterprise and its superiors.

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[39] SCR No. 1, 1980, p. 7: SEC, MOF Circular on Trial Method of Dividing Profits of State-Managed Enterprises.

The above discussion weighs the pros and cons of SPS and TPS on the presumption that one system will be put in place and retained forever, with unchanged retention ratios. In fact, with reform barely two years old, some enterprises have passed through four different systems. And retention ratios, which "in principle" remain unchanged for at least three years, in practice can be changed quite arbitrarily.[40] In most interprises which I visited, retention ratios had been changed annually. In some, 1981's ratio was still not set, as late as April or May. When the rules of the game are in constant flux, the power of the new incentive system is severely eroded. Enterprises suspect—with good reason—that if they greatly increase profits, they will be rewarded with a new and less generous retention ratio. By the same token, they may suspect that if profit falls short of expectations, and thus retained profit proves too small to fund worker welfare and bonuses, the enterprise will be able to convince its superiors that the reasons for the shortfall were "objective"—i.e., beyond its control—and that an "adjustment" will be forthcoming. When a new incentive system is perceived as arbitrary or capricious, its usefulness is largely over. That point may have been reached in China.

V. PAST OBSTACLES AND FUTURE PROSPECTS

The foregoing paints a gloomy picture. Economic reform in China's industrial sector never proceeded very far, and at the moment is at best in stasis. To predict the future, we must understand the nature of the obstacles which slowed reform. We can capture most of these obstacles under the headings: bureaucratic resistance, lack of key institutions, and fear of inflation.

Bureaucratic inertia is a common whippingboy in the wake of a failed reform. China is no exception. The decision to revert to the SPS profit retention system is laid at the door of the Ministry of Finance. MOF is responsible for generating sufficient enterprise profit each year to balance the national budget; it insisted that under the more radical TPS it could not guarantee an adequate level of profit. Other parties with vested interests in the current system have also weighed in against reform. The State Bureau of Materials Supply, deluged with requests for key inputs, certainly was unenthusiastic about allowing a portion of those inputs to flow onto the market. The Ministry of Foreign Trade is blamed for the fact that the July 1979 directives on enterprise participation in foreign trade and retention of foreign exchange "have not been honored".[41] Planning for a reformed system was further impeded when these three agencies and the Ministry of Commerce, unlike other central agencies, declined to provide the State Council's "working group on economic reform" with a set of "draft plans and opinions on reform".

All this could be termed the impedimenta of the existing system. The other side of the coin is the frail condition of the fledgling institutions which would play key roles in a reformed economy. Enforceable inter-enterprise contracts and economic law in general are virtually nonexistent. Enterprises have no access to data: in a system which classifies and conceals economic information as though the nation were at war, it is hard to see how "autonomous" enterprises will get the information which they need to act independently. The banking system (which has been taking some timid steps, through market surveys and the like, toward filling that information gap), is itself another weak link in a reformed system. It has no independent powers, especially at the local level, where, as one author avers, "the banks want to support the state plan and centralization and unification, but because the local party committees disagree, it can't be carried out".[42] And the bank also lacks personnel trained in evaluating requests for credit.

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[40] The regulations provide that retention ratios can be revised if profit changes sharply as a result of various causes beyond the control of the enterprise, including changes in state-set prices or taxes, mergers or other changes resulting from industrial reorganization, and the impact of state investment.

[41] SCR 1980 No. 14 (Nov. 20, 1980) p. 419.

But the shoal upon which, in the end, this reform foundered is the same reef around which lie the wrecks of similar expeditions from Eastern European ports: the specter of inflation. In the inevitable tug-of-war between the reformers' need for price flexibility and the politicians' desire for price stability, the latter won. A State Council circular in April 1980 sounded the first note of warning:[43]

> Some enterprises and units, simply to pursue profit onesidedly, have recklessly expanded the scope and range of permitted price variation. Some have reduced output of low-price products to suit themselves, and concentrated on high-priced products. . . . All this has left the masses unsatisfied. . . . If we don't solve this problem, it will have severe consequences for political unity and stability. . . . The Party center and the State Council consider that the central issue now is price stability.

The threat of inflation is particularly potent in China. In the late 1940s, whirlwind inflation ushered out the Nationalist regime. Through its ability to bring that inflation to a rapid end in 1950, the CCP established its credibility, and even its legitimacy, in the eyes of the population. Even thirty years later, that experience is still vividly alive—for example, in the voice of a reformist economist as he tells me, "You can't imagine what it was like—prices changing every day, every hour. . . ."

But why are reform and inflation linked? The structure of Chinese producer goods prices today is universally acknowledged to be irrational, principally because for thirty years, their rationality hasn't mattered much. But in a reformed system, prices have to be at least roughly correct. Now, even if it were feasible, a price readjustment achieved through the calculations and degrees of the Materials Price Bureau would be inflationary, because of downward-inflexibility of prices (under the new, profit-based incentive system, every interest group will vigorously protect its price and profit margin). But central readjustment of prices, no matter how long it may be proposed and debated, is unlikely ever to see the light of day, simply because of the technical difficulty of calculating rational prices. Instead, the market must do the job; rational prices must be allowed to emerge from direct inter-enterprise bargaining. Such activity is even more certain to result in generalized price rises (and is ideologically suspect to boot).

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[42] Liang Wensen, *opus cit*, p. 183.

[43] SCR 1980 No. 4 (28 May 1980) p. 103: Party Center and State Council Circular on Strengthening Price Management.

The 1979–80 reform movement, of course, never got as far as readjusting producer goods prices. The source of inflationary pressure was the 1979 rise in urban wages and in prices paid to farmers, compounded by the decentralization of financial powers to provincial and county governments and to enterprises. These measures, at least to some extent, were necessary sugarcoating on the reform pill—an attempt to assure every party to reform that all would prosper under the new program. This is the sort of politician's promise which only inflation can "fulfill". It is likely to be a feature of the next Chinese reform movement as well.

Thus we conclude with the dilemma which the Chinese literature on reform has been studiously ignoring. A reformed economy which means to use markets must necessarily use prices. But how to get prices right without letting go of them? Hungary is the only centrally planned economy to come close to solving this puzzle—by using foreign trade prices as proxies, and draining off a part of international inflation through exchange rate manipulation. But China's trade ratio is low, and the cost structure of its industries differs sharply from that of other countries: the Hungarian solution is not practicable. All this leads me to believe that the obstacles to reform in China, especially the price problem, will not be easily overcome.

Let me conclude this paper by reviewing the policy shifts in the course of 1981, and hazard a guess as to the future of economic reform in industry. Despite concern with inflation, September 1980 found China full of renewed momentum for reform. At the National People's Congress, Minister of Metallurgy Tang Ke was subjected to "withering criticism" for the gigantism which renewed centralization had brought. State Planning Commission head Yu Qiuli, not a fire-breathing reformer, was replaced. A remarkable State Council report, dated September 2, sharply criticized incomplete implementation of the July 1979 reform directives, and proposed moving farther and faster.[44]

But at year's end, the roof caved in. A December 2 People's Daily editorial stated that "it is now clear that the task of readjustment is not something which can be accomplished in three years. . . . Reform will continue, but must be subordinate to and beneficial to readjustment. . . . Don't hesitate to make a necessary and adequate retreat (from reform)." In the first half of 1981, reform in industry has not been so much denied as ignored: no movement on price reform, and no extension of enterprise powers.

A major conference in Sichuan in April was billed as a method of building momentum for continued reform, or at least of ensuring that reform remained on the national agenda. The reform timetable which emerged is none too heartening: a one to two year period of concentration on the urgent problems of budget deficits, inflation and agricultural price subsidies, then another three years of sectoral readjustment (increasing investment in agriculture, expanding raw materials and energy production, solving transportation bottlenecks, perhaps some price readjustments), and then, after perhaps five years, further changes designed to "basically rationalize" the economic system.

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[44] SCR 1980 No. 14 (20 November 1980), pp. 419–427; State Council Approves and Passes On the Report of the SEC on Conditions in Experimental Work of Expanding Enterprise Autonomy and Proposals for the Future.

The Chinese economy today, in the midst of major readjustments, is even more chaotic than usual. There is some logic to the argument that a reformed system predicated on a stable, normal external environment within which enterprises can operate autonomously cannot be implemented amid these conditions. But I predict that events may shorten the five-year timetable for the renewal of reform. With a sharply lower investment rate, where will continued growth come from? Higher productivity is the only option left. As the dust of readjustment clears, over the next two years, slow industrial growth may help the reform constituency to coalesce again, i.e., by 1984.

In the meantime, some of the reformist zeal will go toward "industrial reorganization along lines of specialization and (interenterprise) coordination". This policy will be familiar to students of "industrial associations" in Poland and elsewhere. It is an attempt to reduce the high degree of vertical integration endemic to planned economies, and to foster horizontal integration and economies of large-scale production. Such reorganization has accompanied every cycle of recentralization in China, including the current one. It was already actively in progress in 1978, before the more far-reaching reform proposals were implemented. Now it is being touted as part of reform itself—indeed, it is billed as the one aspect of reform which is "subordinate to and beneficial to readjustment". By the end of 1980, more than 1600 of these so-called "specialized industrial corporations" or general plants had been formed in China, each controlling an average of ten plants.[45] The corporation's function is to redistribute production processes among these plants in a more economically rational way.

This activity will undoubtedly succeed in garnering some universally obvious efficiencies. But the policy is not a part of true economic reform; indeed, in some ways it is reform's antithesis, a device for streamlining and facilitating continued central planning. A detailed outline of this policy—by a member of the State Economic Commission—makes this link explicit. It argues that large-scale enterprises should be directly controlled by the central government, in pre-Cultural Revolution proportions (which is to say, upwards of 10,000 enterprises), while smaller enterprises should be organized into specialized industrial corporations.[46]

In the near term, it will be of interest to observe the extent to which this activity will preempt the momentum for genuine reform. The tension between the two is delicately noted by a leading proponent of fundamental reform, who says:[47]

> In my view, the essence of economic methods . . . lies in using economic levers which are related to the law of value. . . . Of course, there is debate over "economic methods". Some comrades understand using economic methods to manage the economy to mean breaking down administrative divisions, administrative departments and administrative levels, and establishing trust-like, specialized industrial organizations, based on objective economic relationships, to substitute for the method of economic management via administrative organizations. This view has a certain logic.

The reality behind this word play is that industrial reorganization is an administrative, top-down process, not the product of independent decisions by enterprises themselves. (At one stage during 1980, such independence was strongly encouraged and facilitated, but in the words of one policymaker, "We gave enterprises freedom to form their own relationships, but nothing happened.")

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[45] Liu Guoguang, *opus cit*, April 1981.
[46] Private communication.
[47] Liu Guoguang, Guomin jingji, p. 13.

Where does this leave us? The most that one can say is that fundamental reform is still on the agenda. Let me close by quoting perhaps the two most important reform voices, but writing in 1981, First, Xue Muqiao, on prices:[48]

> Our experience of the last two or three years proves that to readjust prices purely by means of state planning cannot solve our difficulties. In the past twenty years, outside of the worst, most chaotic periods, we talked about the price problem constantly, and indeed made some readjustments. But the resulting prices were not increasingly rational; on the contrary, they were increasingly divorced from values. The reason is that there are hundreds of thousands or even millions of prices, the cost calculations for which are extremely complex.

Xue goes on to propose that government price-setting be limited to a few standard products, and that major price-setting powers be vested in the new specialized corporations.

Second, Lin Ling, a major figure guiding the Sichuan reforms, writing in the June 1981 issue of Jingji Guanli (Economic Management):[49]

> Sichuan's reforms are being implemented stage by stage: a limited set of reforms first, then an intermediate group, and finally a major set. Those reforms centered on expanded powers for enterprises are a first set. The second group of reforms will center on seting up enterprises which are truly responsible for their own profits and losses, reorganization and merger within industry, breaking down the control structures of local governments and ministries, and carrying out price and tax reform. Last and most important is a future reform in the whole economic structure and organization, and the whole system of economic leadership.

These statements make it clear that fundamental reform has not disappeared from the policy forum. But none of these proposals have clear timetables attached, and those agendas with timetables do not include reform. For the moment, at least, China has decided that the market is not the solution to her most pressing problems.

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[48] Jiage Lilun yu Shixian (Price Theory and Application), I:1 (20 January 1981), pp. 3–9.

[49] Jingji Guanli, June 1981, p. 19.

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CHINA: TRANSPORTATION DEVELOPMENTS, 1971–80

By Albert S. Peterson*

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ABBREVIATIONS

BBC, SWB—British Broadcasting Corp., Summary of World Broadcasts, part 3, The Far East, Weekly Economic Report.
CAAC—Civil Aviation Administration of China.
dwt—deadweight tons.
FBIS—Foreign Broadcast Information Service, Daily Report-China.
JPRS—U.S. Joint Publications Research Service.
km—kilometer.
MOC—Ministry of Communications.
NCNA—New China News Agency.
SSB—State Statistical Bureau.
SSB, 1980—"Main Indicators, Development of the National Economy of the PRC (1949–1979)," State Statistical Bureau, Beijing, 1980.
TGY—"Ten Great Years" (English Edition), Beijing 1960.

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I. SUMMARY

China's transportation networks continued their remarkable growth during the 1971–1980 period.[1] All the modern transport sectors—rail, road, water, air, and pipeline—set new records in freight handling; the traditional sector continued supplementing the modern sector by moving large quantities of goods over short distances. Since 1970, total turnover in ton-kilometers has increased roughly 10 percent per annum. The water sector, with a 14 percent annual growth in turnover, grew at twice the rate of the railroad and highway sectors. Although pre-1977 data has not been released for pipelines, they are estimated to have had an annual increase in turnover greater than 10 percent as many of the pipelines were completed in the 70s. Although the hauling capacity of the air sector is small when compared to the other modern sectors, it showed the highest growth rate, 19 percent, for turnover since 1970. Most of the growth in the air sector can be attributed to its acquisition of long-range aircraft and the rapid expansion of international routes during this period.

In spite of the impressive increase in freight turnover since 1970, China's transport systems at present are barely sufficient to meet economic development needs. In 1980, the railroads, carrying 50 percent of national freight turnover in the modern sector, remained the predominant form of transportation. However, the utilization of railroads is near saturation nationwide and in some areas is lagging behind transport needs. Water transport was second handling 44 percent of the turnover volume. Here, the need for continuous dredging of waterways and harbors and for the modernization of ports and the inland fleet restricts expansion of inland water routes and development of harbors. With a limited number of only poor quality highway routes, the highway departments played mainly a supportive role to other sectors as road traffic accounted for only slightly more than 2 percent of turnover. In light of the recent slowdown in oil production, the pipeline sector, handling 4 percent of modern turnover, probably is the only sector not being pushed to capacity. For the air sector to significantly increase its contribution to the transportation infrastructure, cargo-handling facilities and internal transport system linkages will require modernization.

With annual traffic density already pushing 11 million ton-km/km, the second highest in the world, the rail sector is hard pressed to keep up with growing demands for improved rail transport. Rail traffic is heaviest in the eastern part of the country where most of China's industrial enterprises are concentrated, and in northeast China. The volume of rail freight in these regions accounts for more than 85 percent of the total volume transported by all the country's rail lines. These eastern lines are bumping up against capacity constraints; some weak sections cannot meet present needs. Coal, the highest single volume commodity shipped by rail, accounts for nearly 40 percent of China's total rail volume and as much as 60 percent of the total volume hauled on some lines. Much of China's rail net is still single track, although construction of double-track systems is becoming more widespread. Selected rail lines are being electrified, mainly high density lines involved with coal shipments.

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[1] For transport performance during the 1950's and 1960's see Philip W. Vetterling and James J. Wager, "China: The Transportation Sector, 1950–1971," Congress of the United States, Joint Economic Committee, "People's Republic of China: An Economic Assessment," Washington, D.C., 1972, pp. 147–181.

Calculated on the basis of total land area, China's highway density is so low, 51st in the world, that it is hard pressed to assist China's modernization efforts. Then too, poor service by truck units under the Ministry of Communications caused large numbers of industries and government departments to develop their own trucking units. Unlike the other transport sectors in which a strong central government interest was shown, the development and operation of the highway sector throughout the 70s was largely left in the hands of provincial organizations. As a result, there are not many direct routes and there is no coordinated national highway system. Most roads have hard earth or gravel surfaces; few have asphalt surfaces. Many of the vehicles on the road are suffering from old age, have a low carrying capacity, and use excessive amounts of fuel. Highway systems have a small motor vehicle density; the majority of traffic is comprised of slow-moving rubber-tired farm vehicles and trailers, carts, and bicycles, all of which slow down truck traffic and cause highway congestion. The heaviest concentration of the principal highway net is in the industrialized east. Except in western China, roads are still mostly used for shorthaul freight or as feeders to the other transport systems.

The water transport system, traditionally a key element in Chinese transportation, significantly improved its capabilities to handle both domestic and international cargoes. During the 70s, both fleet and port expansion efforts were directed towards improving the flow of bulk commodities and specialized cargoes. Through construction of specialized cargo facilities, wharves, deep water berths, and more storage areas, and the addition of mechanized equipment, China's port handling capacity has doubled since 1970. Despite this doubling, Chinese ports still are congested with some vessels waiting weeks for berthing space. Rapid expansion of the fleet and rapid growth of foreign trade, especially since 1977, are the prime causes for this congestion as port construction has not been able to keep pace. The inadequacy of the inland distribution system also contributes heavily to port congestion. Railroad and highway service to port areas has not expanded as rapidly as port handling capacity; as a result, cargo accumulates on the docks forcing a delay in discharging ships' cargoes. On the inland waterways, larger ships and barges, new navigational and signal equipment, and increased dredging operations all have contributed to improved carrying capacity. Some of this increased capacity, however, has been offset by the shrinking waterway network. The uncoordinated construction of new dams—irrigation, hydroelectric; flood control—has blocked shipping channels, resulting in the loss of thousands of kilometers of navigable water routes.

Considering the state of the air sector at the beginning of the decade, the sector displayed phenomenal growth especially during the later part of the 70s. Through the purchase of long-range jet aircraft and the signing of a number of air agreements, the Chinese have expanded the total route mileage, both domestic and international, by more than four times since 1970. At the same time, selected air terminals and runways were expanded to handle both larger aircraft and an influx of foreign visitors. Since opening wide the doors to tourism in 1977, an ever increasing number of tourists have been converging on China. Beijing, China's capital city and the hub of the aviation network, is the main stop over point for most foreign tourists.

The pipeline sector, a fairly recent addition to China's transport network, helped lift some of the burden off of the other transport sectors. By the mid 70s when a number of pipelines were completed, pipelines were carrying significant amounts of crude oil from oil fields to refineries and to coastal ports. By 1980, pipelines were moving around 80 percent of all crude oil production. As a result of this switch, space on the railroads was freed up for other commodities; on the highways, the distance was reduced for crude oil shipments.

II. Railroads

A. NETWORK

During the 1971–80 period, the Chinese continued to expand their railway network at the annual rate of 1,000 kilometers that has been maintained for the past 30 years. At the end of 1980, the network was about one-sixth the length of that of the United States, with 52,400 kilometers of mainline track. All of the mainline track is standard gauge except for about 800 kilometers of narrow-gauge track in the southern border province of Yunnan. In addition to the mainline network, there are a few thousand kilometers of rail lines of various gauges that mainly serve isolated industries: the bulk of these serve the timber industry in Heilongjiang and Jilin provinces.

Existing rail lines have been greatly improved over the past decade. Electrification at 25kv 50Hz has been completed on 1,670 kilometers of mainline track or 3 percent of the network, mostly in the mountainous central provinces. Five electrified lines totalling some 2,000 kilometers are now under construction or have been approved for construction. Some 8,000 kilometers of the mainline are now double tracked and more is planned or under construction in the high volume traffic areas of eastern China. Since 1978, a 60 kg/m replacement rail is being used on high density lines and the average rail weight has been raised to 50 kg/m on most lines. About 7,000 kilometers of continuous-welded rail are in place. Concrete sleepers are used on about 45 percent of track, mostly in timber scarce areas or in areas where timber rot is a problem. Creosote-treated timbers are used on the remaining lines. Automatic blocking equipment has been installed on 13 percent of the lines, semi-automatic on 77 percent, and the remaining 10 percent still employs a manual system. Centralized control systems have been installed on about 1,000 kilometers of track and in at least 16 classification yards with 13 of these having mechanical humps.

The railway network at yearend 1980 is largely the result of development strategies over three different periods. From 1949, when the Chinese communists established power until roughly 1965—just prior to the start of the Cultural Revolution—railway construction focused first on restoring the old war-torn rail lines and then on extending new lines into isolated peripheral areas for both political and strategic reasons. From the late 1960s until the mid 1970s, the focus of railway construction gradually shifted toward support of China's economic development programs. In the later part of the 70s, especially since the overthrow of the Gang of Four, almost all railway construction focused on improving connections to agricultural, industrial, commercial, and mineral resource areas.

By the end of the 1970s, new track construction began to reflect new policies readjusting the economy and technical redevelopment of existing lines. Construction centered on developing the coal industry, improving the flow of goods at port areas, and opening up the resources in the strategic areas of the western provinces. Long term plans for the western provinces include a 3,000 kilometer line from Xining in Qinghai Province to Lhasa in the Xizang Autonomous Region through some of the world's most rugged terrain. By 1980, the first stage from Xining to Golmud of 835 kilometers was completed on the northern portion. However, the most difficult section through the high mountains of Xizang and Qinghai provinces remains to be done. When completed, all of China's provincial level administrative units will be rail served.

Other recent construction includes a 475-kilometer southern extension of the Lanzhou-Urumqi route running from Turpan to Korla in the mountainous western desert area. This line, which was opened in 1979 after nearly nine years of construction, offers improved access to the oil resources in western Xinjiang Province. To the east, the 510-kilometer Lanzhou-Baoji line, now being electrified, will provide additional carrying capacity to the rail center at Lanzhou where the Lanzhou-Urumqi route to western Xinjiang Province and the Lanzhou to Golmud line to central Qinghai Province meet. In northeast China, a new 400-kilometer single-track rail line between Tongliao and the developing coal mine at Huolinhe in Nei Monggol was opened to traffic in September 1980 after seven years of construction.

In the east, both new construction and the upgrading of old lines has been directed toward improving the flow of coal from mines in North and Northeast China and toward speeding up the movement of goods to and from the ports all along the coast. The Minister of Railways in late 1979, stated that the main objective of railway construction would be the upgrading of old lines to make it possible to haul more coal from Shanxi, Henan, and Shaanxi provinces and to enable more freight to be carried over the rail lines to China's ports. In late 1980, the Vice Minister of Railways reemphasized this shift of railroad capital construction to rebuild and upgrade the high density lines of eastern China. He stated that although the railway's capital construction funds were limited due to readjustment of the national economy, the capital that was available would be used for improving the eastern lines.

Extensive work to upgrade these high density lines was started during the 1978 to 1980 period and is scheduled for completion during the mid 1980s. In southeastern China, double-track construction was reported to have begun in mid 1980 on the last 538-kilometer single-track section of the Beijing to Guangzhou line running from Hengyang in Hunan Province to Guangzhou in Guangdong Province.

Priority also has been given to boosting the coal-handling capacity of rail lines serving coal-rich Shanxi Province through upgrading four of the five major routes used for transporting coal out of Shanxi to other areas of China. Both the Datong to Beijing and the Taiyuan to Shijiazhuang double-tracked lines are being electrified and the single-tracked Taiyuan to Jiaozuo and Datong to Puzhou lines are being double tracked. At Beijing, a 35-kilometer rail bypass around the northwestern side of the city that will improve the eastward flow of Shanxi coal was completed in 1980. Between Beijing and the Qinhuangdao coal port, construction has just begun on a new electrified double-track route that will greatly increase the eastward flow of Shanxi coal. Double-track construction, underway since 1978, on the Shijiazhuang-Dezhou line in central Hebei and eastern Shandong provinces and on the Jinan-Qingdao route in Shandong will provide increased rail capacity to Shandong's ports. Also in Shandong Province, construction has just started on a new single-track railway between the Yanzhou coal mining area and the coastal city of Shijiusuo where a new coal port is to be constructed.

The Ministry of Railways and its 20 railway bureaus, along with some PLA assistance, performs all construction and maintenance activities. A number of sections have been incredibly difficult to build. Construction crews have overcome high mountains, deep gorges, swift rivers, shifting deserts, earthquake zones, and a wide variety of soil structures as well as extreme variations in climate. Numerous sections had to be bridged or tunneled due to extreme variations of terrain. One of the most difficult tasks was the construction of the 1,085-kilometer Chengdu to Kunming line in south central China that was opened to traffic in 1970. In completing this line, 991 bridges and 427 tunnels, accounting for around 40 percent of track distance, were necessary to traverse a complex geological terrain. The most recent achievement is the 916-kilometer Chongqing to Xiangfan line in eastern Sichuan and western Hubei provinces where bridges and tunnels make up some 45 percent of the line's total length. Opened to traffic in 1978, the rail line crosses 716 bridges and goes through 405 tunnels. As a result of the formidable terrain in these regions as well as that of many other regions in China, some 2,500 kilometers of bridges and a like distance of tunnels are included in the railway network. Most of the bridges built during the 1970s were constructed with prefabricated piers—flexible, rigid, or hollow—that speeded up construction. Most rail bridges have a high load capacity as they are designed to support the weight of heavy steam locomotives.

Meeting past construction challenges has required a strong central railroad organization and a highly competent work force for construction and maintenance. With only around 30 percent of its track maintenance work mechanized, much of the construction and maintenance work still is done by hand. This is an advantage for the Chinese with their high traffic density as most maintenance work can be performed between train intervals with machinery that can be easily moved on and off the tracks. The heavier track equipment generally is employed in new line construction. Both light and heavy track equipment is manufactured by the Chinese. Heavy equipment includes a tracklaying machine capable of laying 4.5 kilometers of new track daily. Probably the single biggest problem facing the work crews in upgrading high density lines, both in the late 70s and upcoming 80s, is the large number of bridges and tunnels that need to be rebuilt as lines are double-tracked and or electrified.

B. ROLLING STOCK

Between 1970 and 1980, railroad rolling stock, both locomotive and freight, increased at an average annual rate of 5 percent. The locomotive fleet, estimated at 10,562 units, was roughly 78 percent steam, 20 percent diesel, and 2 percent electric at the end of 1980. Since 1970, steam locomotives have declined only 3 to 5 percent as a share of the inventory despite increasing use of diesel and electric locomotives. Because of slow rates of conversion, steam will provide the main source of locomotive power for at least the next ten years. The fleet has two main steam engines models: the 2,300 hp "Liberation" type 2-8-2 weighing between 91 and 118 tons and the 3,100 hp "Peace" type 2-10-2 weighing between 150 and 220 tons. There are three basic diesel designs: the "Eastwind" in both 3,300 and 3,600 hp models, the 2,000 and 3,000 hp "East is Red" models, and the 4,000 hp "Giant Dragon." Foreign built diesels, 5,000 and 5,500 hp German Henschels, 4,000 hp French Alsthoms, and 2,100 hp Romanian Electroputeres, account for about 7 percent of diesel power. The electric portion of the fleet consists of various versions of the Chinese built "South Wind" electric locomotive in the 5,000 hp class and 50 French Alstrom electrics rated at 4,000 hp.

The freight car inventory at the end of 1980 was estimated to be at 290,400 units with an average car capacity of nearly 50 tons—roughly equivalent to the United States car capacity during the 1940s. Gondola and hopper cars, about 50 percent of the inventory, and tank cars, around 20 percent of the inventory, make up most of the fleet as would be expected since bulk commodities comprise the greatest share of freight volume. Most of the remainder of the inventory consists of box cars, stock cars, and some refrigerator cars. The number of mechanized and specialized car types is very small; unit trains, as used in the United States, do not exist. By 1980, the passenger car fleet had some 17,000 coaches, mostly of an old Soviet style of heavyweight construction.

TABLE 1.—CHINA: RAILROAD ROLLING STOCK

Year	Production		Inventory	
	Locomotives	Freight cars	Locomotives	Freight cars
1970	573	13,800	6,530	175,000
1975	526	15,700	8,627	237,000
1977	293	6,396	9,252	254,900
1978	521	16,950	9,675	269,300
1979	573	16,042	10,149	282,600
1980	512	10,571	10,562	290,400

Sources:

Production—Locomotives and freight cars: 1970-75: SSB; State Economic Commission; 1977-79: SSB, 1980; 1980: FBIS, Apr. 29, 1981, K-2.

Inventory—Locomotives: 1979: "Economic Reporter," October 1980, p. 30. Remaining years estimated based on 1952 inventory (CIA, "China: Economic Indicators," ER 78-10750, December 1978, p. 37), reported and estimated production figures, and an assumed average yearly retirement of 98.6 locomotives based on a 30-yr life.

Inventory—Freight cars: 1970, 1975: CIA, "Handbook of Economic Statistics 1980," ER 80-10452, October 1980, p. 22, 1977-80: estimated based on reported and estimated production figures and an assumed yearly retiremen of 1 percent.

By 1980, China had at least 30 rolling stock plants specializing in production or repairs of locomotives or rail cars or both. Locomotive production in China began in the early 1950s by copying steam locomotives of Soviet and American design. Prototype diesel and electric engines were developed in the late 1950s and series production began in the mid to late 1960s. During this past decade, China developed a locomotive production capacity sufficient to meet its needs; it is estimated that China acquired no more than 10 locomotives a year from foreign sources during this period.

Mainline locomotive production is centered on six main plants. Steam engines are produced at the Datong plant in Shanxi Province. Electric locomotives are made at the Zhuzhou plant in Hunan Province. The four remaining plants, all specializing in diesel locomotives, appear to be underutilized. In 1979, 222 diesel locomotives were produced compared to 311 steam and 40 electric; roughly the same percentage split, 55 percent steam, 40 percent diesel, and 5 percent electric, has been maintained over the past decade.

Diesel locomotive production will probably remain well below capacity through the 1980s for two main reasons—a slowdown in oil production and a large inventory of steam locomotives along with the coal resources to drive them. Dieselization is no longer being pushed as China attempts to conserve oil especially in light of the stagnation in oil production that began in 1979 and is likely to continue through the mid 1980s. Therefore, the Chinese must continue to depend mostly on steam locomotives which are the least energy efficient type. Electric traction, although less energy efficient and also more expensive to develop than diesel, will gradually replace steam on selected high density routes. Electric locomotives provide a tractive force up to 50 percent greater than diesels, have a cheaper cost per horsepower than diesels, and require less maintenance than diesels. The rail sector, as well as the other transport systems, must compete for energy with other sectors of the economy, such as agriculture and industry. The limited availability of both diesel fuel and electricity are two constraints that China needs to overcome before it can begin to scrap steam locomotives.

Since 1970, China has produced an average of 12,000 freight cars a year, which was sufficient to maintain an adequate inventory. The opposite is true for passenger wagons because past emphasis has been on freight car production in spite of the rising demand for passenger travel. Output of passenger cars, first reported as a separate category in 1977, rose quickly from 538 in 1977 to 1,002 cars in 1980, an average of slightly less than 800 coaches a year. Between 1977 and 1980, rail passenger turnover equalled 21 to 24 percent of freight turnover and increased at a faster rate than rail freight, 10.7 percent annually versus 7.9 percent. Assuming an average of 8,000 to 10,000 freight wagons a year to maintain the freight car fleet, China will need in the neighborhood of 1,500 coaches a year to maintain the passenger car fleet plus another 500 or so coaches a year to expand the fleet.

During the 70s, rolling stock plants and repair facilities turned out a variety of higher capacity rail cars and improved maintenance and repair service. Most freight cars now coming off the production lines have a 60 ton or higher capacity. As a result, the average car capacity in the inventory has been increasing about six-tenths of a ton annually during the past decade. By 1980, the average freight car capacity had reached 50 tons. On the whole, more than 80 percent of the cars have a capacity of 50 tons or greater, while 30 percent of the cars have a 60 ton or greater capacity. Most plants are combination production and repair facilities and technological improvements in production carry over to the maintenance and repair section of the plant. Because modern freight cars gradually have been replacing the older wooden freight cars and more specialized freight wagons have become available, the damage rate has decreased. The older cars are more susceptible to damage, especially with the increase in mechanized loading and unloading. During the 1970s, an estimated 70,000 to 80,000 freight cars were damaged annually. Despite this damage rate, repair facilities appear to do a good job at returning cars to service. The ratio of freight cars under repair was reported as 3.2 percent in 1978; the same ratio is expected in 1980. Periodic maintenance checks hold down the number of accidents and catch a number of minor defects before they become major maintenance problems. For example, frequent checks appear to greatly reduce the number of overheated journal bearings, that if undetected could cause a derailment. The bulk of the rail cars have the older journal bearings because the Chinese only recently have begun to use roller bearings. In comparison, roller bearings have been required on all United States cars produced since 1963.

C. TRAFFIC AND OPERATIONS

The railroads, still the predominant form of transport in China at the end of the decade, handled 49.6 percent of total freight turnover reported for MOC organizations. Total turnover in ton-kilometers rose from 284.7 billion in 1970 to 571.7 billion in 1980, reflecting an annual growth rate of 7.2 percent—nearly two percentage points above the United States' growth rate. By 1980, annual traffic density was nearly 11 million ton-km/km, more than double that of the United States and second in the world only to the Soviet Union. However, due to this high traffic density, railroad utilization is near saturation nationwide and, in some areas, is lagging behind transport needs. Rail traffic is heaviest east of the Beijing-Guangzhou rail line in the eastern part of the country and in Northeast China where most of China's industrial enterprises are concentrated. Many of the lines in these areas are fully saturated; some weak sections can only meet 40 to 70 percent of the actual needs. The rail lines in these regions handle more than 85 percent of the total volume transported by all the country's rail lines. By itself, the Beijing Railway Administration Bureau, one of 20, handles one-sixth of the total volume.

During the 70s, the railroads continued to be the prime mover of bulk commodities, annually handling roughly 50 percent of total volume shipped by rail, road, and water. The rail share of the total has been gradually increasing and in 1980 reached 52.3 percent. However, if tonnages originated in the pipeline and air sectors were known, the railroads' share of total volume shipped by all sectors would probably show a slight decline as the pipeline and air sectors both were expanded rapidly during the 70s. As a result of pipeline construction, railroads were carrying only 20 percent of all crude oil production by 1980. This 20 percent of production plus the bulk of refined products accounted for roughly 5–6 percent of rail freight volume. On the other hand, coal, China's number one energy resource and the highest single volume commodity shipped by rail, is largely responsible for rail maintaining its 50 percent share of tons originated. For over twenty years, the railroads have been moving some 65 percent of coal production which annually amounted to 37–38 percent of the total rail-freight volume. Well below the volume of coal, ores and construction materials, with roughly equal shares, account for 34–35 percent of total rail freight. The remaining portion of total rail-freight volume consists of iron and steel, timber, food grain, and miscellaneous shipments with no single commodity exceeding the 5–6 percent accounted for by iron and steel. Containerized freight consists of 1-, 3-, and 5-ton boxes as the railroads are not yet capable of handling international-sized containers. During the 80s, China is expected to develop at least a limited rail capability for transferring the international 20- and 40-ft containers, now being handled at the ports, to selected inland points.

Although China's railroads are not considered modern in comparison to those of industrialized nations, the Chinese continue to make remarkable progress as shown by the increases in both turnover and tons originated. Modernization efforts and operational and maintenance improvements contributed heavily to this growth. Electrification and double tracking, improved traction power, larger capacity cars, modernized classification yards, new stations, and automated control systems are some of the improvements undertaken to improve capacity. Operational and maintenance improvements also have increased the rolling stock utilization rate.

By 1980, these modernization efforts had produced some impressive results. Freight cars had an in-service ratio of around 93 percent. Turn-around time for freight cars had been reduced to 3 days which is quite impressive considering that in the United States freight car turn-around time now is around 25 days. The on-schedule rate was 93 percent for freight trains and 97 percent for passenger trains. The average speed of freight trains was 29 km/hr, down 1 km/hr from 1970 largely as a result of the increased number of passenger trains, but 1 km/hr above the United States average. As of now, the highest speed permitted are 110 km/hr for passenger and 80 km/hr for freight trains. Intervals between trains have been reduced to 10 minutes, and with additional signaling improvements and double tracking the Chinese hope to shorten the interval to 8 minutes. The average freight train consists of 48 to 53 cars hauling around 2,500 tons with each car loaded at or near capacity. In comparison the average freight train in the United States consists of 68 cars hauling some 4,500 tons but with the average car carrying only 85 percent of capacity. During the 80s the Chinese hope to raise their average tonnage of freight trains to between 4,000 and 5,000 tons by double tracking older lines and by lengthening both passing tracks and station areas. Currently, the length of passing tracks and size of stations are the main restrictions limiting operations to 48- to 53-car trains.

Compared with United States railroads, China's railroads are quite productive, for although they are not as modern, they move more freight with less equipment. The Chinese, with slightly more than one-third as many locomotives and less than one-fifth of the freight cars, handled three-quarters as much tonnage as did the American railroads in 1980. With a railway network less than one-third the length and an average length of haul roughly half that of the United States, the Chinese freight turnover was nearly 40 percent of that accomplished by American railroads. Chinese turnover would have been higher still if not for the fact that its railroads carry a good percentage of short-haul goods that in most countries are moved by truck. Nationwide, an estimated one-quarter of the rail tonnage travels less than 100 kilometers; in the Beijing Bureau, one-third of the freight travels less than 100 kilometers and more than one-half of this moves less than 50 kilometers. Historically, the bulk of Chinese rail shipments originated with the heavy industry and construction material sectors whose tonnage had a high weight to volume ratio and was moved long distances. With the recent shift of production emphasis away from heavy industry towards light industry, a larger amount of tonnage with a low weight to volume ratio will be shipped short distances by rail unless the highway sector can be expanded to carry a larger share of short-haul traffic.

III. HIGHWAYS

A. NETWORK

China's road system grew by nearly 40 percent over the last decade. Nevertheless, it is still basically a substandard system, even by Chinese standards—Chinese articles reproving the present state of China's roadways have noted that approximately 50 percent of the highways do not meet the standards of current highway technology. Of the 890,000 kilometers of highways in the country, more than 300,000 kilometers of highways, including some paved roads, cannot be kept open to traffic under all weather conditions. Asphalt, residual oil, or concrete surfaces cover only about 150,000 kilometers of the total road network. Some 500.000 kilometers of railway are paved with hard packed sand and gravel surfaces and the remaining 240,000 kilometers of roadways are mainly unpaved dirt roads with many of these being little more than cart tracks. Over 90 percent of all China's communes and some 50 percent of its brigades are connected by highways. Nevertheless, there are still populated areas accessible only by footpath—at least two counties still are totally without road services.

As the quantity, quality, and interconnection of highways have a close bearing on the development of the national economy, the underdeveloped highway network is hard pressed to contribute to China's modernization efforts. Calculated on the basis of total land area, China's overall highway density ranks 51st in the world, being only one-fifth of India's and one-half of Brazil's. There is no coordinated national highway system of main trunk roads; as a result there are not many direct long-distance routes. A number of roads also end in deadends at provincial or county lines, because of lack of inter-jurisdictional planning. Most roads serve as short-haul feeder roads except for the more remote areas—especially in the western half of China—where long distance routes over difficult terrain carry a significant volume of truck transport. The heaviest concentration of the principal highway net is in the heavily-populated industrialized east. Even here, roads are still mostly used for short-haul freight or as feeders to the railroad or water transport systems.

The very poor quality of Chinese highways discourages long distance travel. Given the small amount of hard surfaced roads, the majority of the network requires constant maintenance—especially in the mountainous regions where washouts and landslides require constant attention. Even the hard surfaced roads are a problem. In the past ten years or more, whenever the Chinese ran short of asphalt, the roads were surfaced with residual oil. But in their efforts to quickly expand the network, they failed to stress quality. As a result, most residual oil surfaces lasted little more than a year and require repeated repairs.

China has about 128,000 highway bridges totaling more than 3 million meters in length. However, there still are over 700 ferry locations where bridges are needed and there are over 100,000 meters of dangerous bridge crossings that need to be rebuilt. Though permanent bridges now account for about 93 percent of the total number of bridges, many of them do not meet width or load-bearing standards. Bridge building technology, however, has gradually improved as the Chinese developed their own technology and adopted the techniques and designs of foreign bridge-building companies. More than 30 bridges now span the Huang Ho (Yellow river) including the 3,429-meter bridge at Luoyang in Henan Province. In 1980, the first highway bridge across the upper reaches of the Chang Jiang (Yangtze river) near Chongqing in Sichuan Province was opened to traffic. This 1,120-meter long bridge stands some 60 meters above the river providing clearance for ships of up to 5,000 tons during the high water season. In the deeper reaches of the Chang Jiang at Nanjing, a combination railway-highway bridge with a total span of over 6,700 meters has a 1,570-meter main span that provides only 20 meters clearance during high water and 30 meters during low water. Completed in 1968, this bridge now restricts the passage of ships to around 5,000 dwt, whereas the river channel on up to Wuhan is probably capable of handling 10,000-dwt vessels. In the mountainous western half of China, bridges also are being upgraded. In Xizang, concrete structures have replaced the old wooden bridges on the region's two main highways that provide the principal connection to other parts of China. All 53 bridges on the Qinghai-Xizang highway and 216 of the 256 bridges on the Sichuan-Xizang highway have been replaced by reinforced concrete structures.

The lack of a unified national highway system and the poor condition of the road network stems in part from a decision made over 20 years ago. Prior to 1958, the central government was responsible for planning and constructing trunk highways; the local governments were responsible for regional highways. But after 1958, the general highways bureau, the highway planning academies, and the highway engineering bureaus were shut down and the entire system of highway administration was abolished, with the technical files and data all abandoned. Since then, various departments have administered different parts of the highway system. At present, nominal authority for trunk highway construction and maintenance is vested in the Ministry of Communications. Lately, provincial and municipal critics charge, probably with just cause, that the Ministry of Communications has no interest in the highway system and is only concerned with fostering water transport. In actuality, most of the responsibility for the planning, construction, and maintenance of roads falls to provincial and county authorities, and in some cases, especially in the more rugged terrain of western China, to the People's Liberation Army (PLA).

During the past two decades, a number of other events have affected the development of the highway sector. For example, since the early 60s, most road building and repair projects were attempted without technical competence or the highway traffic data needed for analysis and research. Only within the past two years have the Chinese started conducting technological and economic surveys on national and provincial roads to enable planning and design of a more modern highway system. However, the current ability of the highway workers to fully utilize these surveys is questionable.

A key weakness at all levels of highway workers is the low competency level. Few workers received professional training during the turbulent times of the 60s and 70s as educational institutions were severely disrupted by the anti-science and technology attitudes that prevailed during the Cultural Revolution and the Gang of Four eras. Furthermore, many of the road building engineers and technicians who had been trained in the 50s and had the skills to train others had been "sent down" to the factory or the farm. For those engineers and technicians who stayed and those who later returned, the periodic intensification of the attacks against educated workers gave them little incentive to show their knowledge or keep up with technological advances.

The emphasis on self-reliance that began in the early 60s and covered nearly two decades probably also affected the highway sector—the least mechanized sector and the only one without a strong central organization—more than any of the other transport sectors. As an end result most roads were built without mechanization or technical knowhow by road teams organized at the county and provincial level. The teams operated under the "several ones" program which called for the masses, by their own hands and with local materials, to level one precipitous slope, straighten one sharp turn, and build one kilometer of standard road a year. Under this program of employing only manual labor and local materials, road crews used roadbed materials usually obtained near the worksite regardless of their suitability. As a result of these practices, many of the road building skills of today's work force were acquired by trial and error during the course of building substandard roads.

During the past decade, emphasis was placed on strengthening the road network in the western and southern border areas and on improving access to some cities in the industrialized East. In the South the Chinese worked at widening and otherwise improving the supply highways leading from Yunnan and Guangxi provinces to North Vietnam during the early 70s. In the Southwest, the last section of the Yunnan-Xizang highway was completed in 1974. Begun in 1967 by the Yunnan provincial authorities, this road links up with the Sichuan-Xizang highway at Markham to provide an additional route to Lhasa. Since 1972, the Chinese have been working on upgrading both the Sichuan-Xizang and the Qinghai-Xizang highways by widening and tarring the roadways and by installing permanent bridges and tunnels. As noted earlier, most of the bridges on these two roads have been upgraded; however, the work is not completed. In 1981, Lhasa authorities still are calling for a stepped up bridge and road construction effort, with emphasis on blacktopping the Qinghai-Xizang highway. In the oil producing regions of the northwest, road building efforts have been directed at providing new or improved oil field to railhead truck routes as there are few oil pipelines in the area. The latest effort is a 532-kilometer asphalt highway being built in northwestern Xinjiang Province by an engineering corps from the PLA that will connect the towns of Dushanzi and Kuqa.

In the later part of the 70's, construction emphasis shifted to improving the quality of existing trunk highways, especially in the more heavily populated cities of the industrialized coastal areas, and away from the practice of lengthening the overall network. The Chinese realized that due to the inadequacy of the urban highway network the rail and water systems were carrying a considerable volume of short-haul cargo—cargo that in industrialized countries is carried primarily by truck. In an effort to alleviate the situation, the Chinese began improving access routes to larger cities and widening selected intercity streets—an effort that has resulted in the construction of their first expressway type roads. In Beijing, the northern section of the second ring road is now open, a limited access type highway complete with cloverleaves, a 23 to 28 meter wide vehicle surface, and separate 6 to 9 meter wide bicycle lanes. The southern half of the second ring road along with an innercity ring and a third outer ring road are under construction. These three concentric expressway type rings are designed to connect Beijing's main feeder highways and to ease the innercity traffic load.

On the outskirts of major cities, access roads also have been improved. The three most noted are the 39-kilometer Beijing-Miyun highway, the 25-kilometer Nanjing-Liuhe highway, and the 27-kilometer Shenyang-Fushun highway. Common characteristics of these routes are roadway widths of at least 25 meters, median strips, and shoulder lanes for slow moving traffic. In addition to speeding up the traffic flow, these newly straightened highways shorten the travel distance between cities. The Shenyang-Fushun route was shortened by 17 kilometers; the new Beijing-Miyun road cut 7 kilometers off the old route.

Continuing the trend of the last few years, highway construction during the decade of the 80s will consist primarily of improvements to the existing highway network. The main emphasis is to be directed toward improving the high density trunk highways and connecting them into a 100,000-kilometer national arterial highway network by 1990. Special emphasis is to be given to improving access to large cities of 300,000 population and over, major ports and rail centers, industrial, mining, and agricultural areas, and major tourist sites. At the same time, the Chinese plan to continue to strengthen highway transport in the mountain and border areas, and in areas inhabited by minorities. The Chinese will have no easy task in achieving these goals. The lack of funds probably will continue to hamper highway construction as it has in the past. Then too, there still is no evidence of highway construction being planned or directed by a national level organization. The construction of the Beijing expressways and the three access highways previously mentioned was accomplished by municipal or provincial authorities.

Other factors that will thwart road improvement projects are the small amount of mechanized road building equipment and a shortage of skilled operators. Having only recently purchased or built some specialized road building equipment, the Chinese still are heavily dependent on manual labor. This dependence is illustrated by a 1974 Beijing Review article on Yunnan road building that noted that improved technology had resulted in the shoulder poles and baskets of the professional road builders giving way to rubber-tired carts. An additional problem facing highway planners is a shortage of suitable land, especially in the heavily populated East. In many cases, the only available land is arable land—land with which the Chinese are reluctant to part. As their overall goal for this decade is to improve highway quality—a much more difficult task than building dirt roads to communes—it is doubtful that the Chinese can do little more than stay even with the growing demands for both short- and long-haul truck transport.

B. MOTOR VEHICLES

At the end of 1980, there were around 1.7 million civilian motor vehicles in China, 4 times the 1970 number. Medium- and heavy-duty trucks make up roughly 74 percent of the inventory, buses account for a further 19 percent, and the remaining 7 percent are comprised of jeeps, automobiles, and special purpose vehicles. Most of the trucks in the inventory are of the general cargo type of which the 4-ton "Liberation" general-purpose model is prevalent. The number of trucks with capacity greater than 8 tons and small ½- to 1-ton pickup type trucks are very limited. As no private automobiles are allowed, there are few cars and their number is not expected to increase significantly. In fact, the production of one car, the "Red Flag" sedan, was scheduled to stop in June of 1981 because of its excessive fuel consumption. The Chinese are just beginning to consider the use of diesel truck engines, and almost all of the inventory is gasoline powered. Overall, the truck inventory is suffering from old age and outdated technology. A good number of the vehicles have been in use 10 to 20 years and of these many are of the "Liberation" type that was first produced in 1956, and still produced today, as a copy of an old Soviet ZIL–150 which the USSR no longer produces.

TABLE 2.—CHINA: CIVILIAN MOTOR VEHICLES

Year	Production	Inventory
1970	87,000	434,000
1975	139,800	918,000
1977	125,400	1,199,000
1978	149,100	1,358,000
1979	185,700	1,554,000
1980	222,000	1,747,000

Sources:

Production: 1970: "Economic Reporter," August 1980, p. 34; 1975: SSB, State Economic Commission; 1977–79: SSB, 1980; 1980: FBIS, Apr. 29, 1981, K–8.

Inventory: 1970: CIA, "China: Economic Indicators," ER 78–10750, December 1978, p. 37; 1975, 1977–79: Ministry of Communications, 1980; 1980: estimated.

The bulk of the inventory, comprising some 40 different models, was produced in China with domestic production being supplemented with foreign vehicle purchases of 15,000 to 25,000 units per year during the 70s. Light commercial vans, small buses, a few cars, and large 100- to 150-ton dump trucks were the main import types. The West European nations supplied more than half of the imports, smaller amounts came from Japan (the largest single country supplier), the Soviet Union, and the United States. Within China, trucks and automobiles are manufactured in some 130 plants ranging from the assembly-line operations at the large Changchun plant, producing at its 65,000 unit a year capacity, to small plants turning out less than a hundred vehicles a year.[2] In addition, there are about 2,400 motor vehicle parts works. Recently the Chinese have begun to consider closing down, suspending, or merging their scattered facilities in order to improve and standardize operations. In early 1981, an integrated motor-vehicle company that cuts across provincial lines was established in Hubei as a joint enterprise of a number of vehicle plants. This is intended to avoid duplication of capital construction and equipment, especially for production of the same model 5-ton truck. In an effort to upgrade motor vehicle technology, the Chinese have approached foreign companies; Japanese-Chinese cooperation negotiations have been given the most press coverage. The Japanese also have been approached for help in developing a Chinese motorcycle industry and as a partner in a joint venture operation. China currently produces its own motorcycles. Although past production figures are not known, production probably has been increasing steadily as the 1981 production target is 180,000 motorcycles.

C. TRAFFIC AND OPERATIONS

Since 1970, motor transport has grown the slowest of any of the transport modes. Freight turnover performance of motor vehicles under the Ministry of Communications in 1980 was estimated at 27.5 billion ton-kilometers, a 5.5 percent annual rate of growth since 1970 compared to a 7.2 percent and 14.1 percent annual growth rate for rail and water, respectively. However, most of the annual growth in truck turnover, 6.9 percent per year, occurred during the 1970–1978 period; in the last 2 years annual growth has been almost nil.

The lack of significant growth can be attributed largely to organizational structure and the method of reporting tonnage. The various levels of transport organizations under the Ministry of Communications only control approximately 15 percent of the national truck inventory; "private" vehicles owned by other government organizations, and industrial and agricultural enterprises account for the remaining 85 percent. Various Chinese sources have estimated that "private" vehicles hauled only one-third as much tonnage as the professional transport organizations accomplished with only 15 percent of the truck inventory. It is extremely unlikely that this "private" vehicle tonnage has been included in the national figures. The main evidence of this exclusion is the State Statistical Bureau's (SSB) explanation of the 1979 reduction in freight turnover by trucks. The SSB attributed the decrease in national truck turnover to industrial and commercial departments that were hauling more of their own freight in "private" vehicles. The exclusion of non-Ministry of Communications figures from the national truck tonnage figures published by the SSB has most likely been the practice for the past thirty years. In the late 50s and early 60s much was published on the significance and use of short-haul transport facilities owned and operated by industrial, commercial, and agricultural activities as compared to the long-haul transport function performed by the modern means of the specialized transport enterprises owned and operated by the State (now the Ministry of Communications).

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[2] The five principal truck plants (and main products) are the Changchun No. 1 Motor Vehicle Plant in Jilin Province (4-ton truck), the Shiyan No. 2 Motor Vehicle Plant in Hubei Province (5-ton truck), the Nanjing Motorcar Plant in Jiangsu Province (2.5-ton truck), the Jinan Motor Vehicle Plant in Shandong Province, (8-, 10-, 12-, and 19-ton trucks), and the Shanghai Heavy Duty Truck Plant (4-, 15-, and 32-ton trucks). Jeep production is centered at the Beijing Motor Vehicle Plant

The many problems arising from deficiencies in organizational, operational, and administrative control of the highway sector have hampered the growth of truck transport during the past decade. As there has been no one central organization in the area of motor transport which oversaw all operations, different elements within the highway sector have progressed toward self-determined goals that many times proved to be inefficient or counterproductive. As noted earlier, the MOC with control of 15 percent of China's trucks has been criticized for its lack of interest in the highway sector.

Another problem has been the poor service and "bureaucratic ways" of some of the special transport companies under the MOC that result in late deliveries, refusal of service, and lost or damaged cargoes. In response, industrial, commercial and agricultural enterprises have built a "private" fleet which accounts for 85 percent of the truck inventory to handle their own trucking operations—operations that are inefficient in light of the volume of cargo moved. As these enterprises cannot engage in "for-hire" operations many vehicles leave with less than a full load and most return empty. With these "private" trucks running empty half of the time, transport costs and fuel consumption per ton of cargo is increased and a number of unnecessary vehicles are added to the already congested highways.

Throughout China, the large volume of slow-moving non-motorized traffic and the poor quality of the road surfaces limits the trucks to an average speed of 28–30 kilometers per hour, a speed that reduces vehicle availability and increases vehicle operating costs. This is especially troublesome around large cities, industrial areas, and port complexes where heavily congested roads are the chief hindrance to an efficient truck operation. Here, a wide variety of vehicles including large numbers of bicycles, human and animal drawn carts, as well as buses, jeeps, and trucks are all vying for the same route in the absence of controlled-lane highways. In addition, truck traffic, both local and long distance, is restricted to selected routes as many of the roads and bridges are unsuitable for heavy truck traffic. Then too, poor road conditions, narrow and weak bridges, and the lack of specialized trucks are the main reason for China's inability to provide door to door service with the standard 20- and 40-foot international containers that are arriving at the coastal ports.

During the latter part of the last decade, the Chinese in an attempt to alleviate some of these deficiencies began to push for changes and improvements in trucking operations. Some regional trucking companies have been formed that cut across both administrative and commercial lines thereby reducing the need for unloading and reloading at administrative transshipment points. An attempt to organize and combine motor vehicle usage has permitted the mothballing of a number of older, less efficient vehicles with a resultant fuel savings. Consequently, the remaining vehicles generally are in better mechanical condition, are more fuel efficient, and have a higher utilization rate. In an effort to reduce congestion, a few controlled-lane access routes and some electric traffic control signals have been provided in the largest cities. The Chinese, however, are a long way from solving their road transport problems. Even if they could manage an all out effort providing maximum funding, training, and leadership under strong central guidance, many of the weaknesses of the present road transport systems still would exist at the end of the next decade.

IV. Traditional Transport

Although the role of motorized transport has expanded, traditional modes of transport continue to make an important contribution to the overall distribution system. A significant amount of cargo—estimated to be around twice the total reported volume moved by the modern sectors—is moved by a variety of traditional means. These means of traditional transport belong to industrial, commercial, agricultural, and individual enterprises, to administrative organizations outside of the MOC's sphere of control and reporting, as well as to private individuals. They include human porters, pack animals, wheelbarrows, human and animal drawn carts, bicycles, junks and sampans, and tractor drawn farm wagons. Traditionally, this highly labor intensive sector has been the prime mover of materials over distances of up to 5 kilometers on land and up to 5 to 10 times farther on water. In northern China, human and animal drawn carts are more widely used for these short distance movements than in southern China where a variety of small boats perform a large part of this function.

Over the past 30 years, various sources have estimated that traditional transport methods account for 60 to 75 percent of the total volume of short-haul goods. In terms of ton-kilometers, however, traditional transport plays only a minor role as it probably adds less than 10 percent to the total turnover reported for modern means. Traditional transport contributes to the flow of goods in three main areas: the interflow of goods between rural and urban areas, feeder-type operations to modern means of transport, and rural area transport in farming areas and in areas of rough terrain.

Although slow and expensive, traditional forms still provide the basic means for moving goods over very short distances and are in as much demand today as they were nearly 20 years ago. In 1963, a Beijing article reported that approximately 40 percent of the total labor of all rural communes was employed in transport activities. Since then there probably has been a shift toward the use of more wheeled vehicles and away from the human porter operations. Nevertheless, a 1979 NCNA broadcast related that in two provinces, Sichuan and Shanxi, 40 percent of the available manpower still was employed in transport activities even though 70 percent of the tractors were used for transport. Another report commenting on the lack of modern transport in mountainous regions gave an idea of the expense and time involved when using traditional transport. In western Hebei province, in 1975, it required nearly 2 man-days to move one ton one kilometer by traditional means. In the area of personal transport, the use of bicycles has accelerated and the number of bicycles is increasing rapidly. In 1980, 13 million bicycles were produced, nearly 4 times the 1970 figure.

Though traditional means of transport make a significant contribution to the overall movement of goods and people, they are a detriment to modern transport systems. The huge volume of slow moving traditional transport leads to serious traffic congestion that both reduces the efficiency and increases the cost of modern transport. Congestion is particularly troublesome within the cities as a majority of the journey-to-work traffic is by bicycle. In Beijing alone there are 3.2 million bicycles; an average of 200,000 more are added each year. This growing density of innercity bicycle traffic is one of the major obstacles to increasing motor vehicle efficiency that the Chinese must overcome. In rural areas where there is a smaller volume of traffic, traditional transport is not as disruptive as in the cities. On the rural trunk highways, tractors and horse drawn carts account for about one-fifth of the total traffic volume. Still their slow speed, about 5 to 10 kilometers per hour for horse drawn carts and around 15 kilometers per hour for farm tractors, results in less economical use of motor vehicles because they are forced to operate at a lower average speed.

V. Inland Waterways and Coastal Shipping

A. NETWORK

The water transport section, linked with motor roads and railways, forms a vast communications network in the heavily populated eastern third of China. China's water transport network includes a coastline of 18,000 kilometers with about 6,500 off-shore islands and an inland waterway system for somewhat less than 136,000 kilometers with some 77,000 kilometers being open to motorized boats. Inland waterways, generally oriented in an east-west direction, carry cargo to and from the coastal zones where the ocean ports handle both foreign and domestic transshipments.

In central China, the interconnection of inland waterways and coastal ports plays a more important role in the movement of goods than in north and northeast China. Here, the 6,300 kilometer-long Chang Jiang (Yangtze River), China's major inland waterway, connects Sichuan Province with Shanghai, China's largest volume port, and points between. Further south, the Xi Jiang (Pearl River) system provides the principal connection between eastern Guangxi and Hong Kong. In the Northeast, the Heilong Jiang (Amur River) and its tributaries—the Songhua, Nen, and Wusuli (Ussuri)—provide summertime river shipping; during the winter season, trucks operate on the frozen surfaces. Most rivers in North China, including the Huang Ho (Yellow River), are of limited use as navigable waterways due to heavy silting and seasonal periods of very low water. The Yun He (Grand Canal) and the Huai He in the southern part of the North China Plain are two exceptions. On a 600-kilometer section of the southern Yun He, the only north-south waterway of any significance, repairs and improvements have greatly increased the volume of shipping. Improvements on the eastern portion of the Huai He opened the way for the movement of Anhui coal along the Huai He and down to the Chang Jiang via the Yun He.

Over the past decade, the carrying capacity of some inland waterways has been improved by restoration and mechanization of old ports and construction of new ones, dredging of channels and ports, installation of new navigational and signal equipment, and the addition of modern barge and tug fleets. On the other hand, some of China's modernization projects—especially the poorly planned use of water resources in southeast China—have adversely affected inland shipping networks. In 1961, China had 172,000 kilometers of navigable waterways, but because of poor water resource planning, the network had shrunk to 136,000 kilometers by 1978.[3] The shrinking network is the result in part of new dams for irrigation, flood control, and hydroelectric projects, which in many cases were constructed by local units in a haphazard fashion causing waterways to be closed to through navigation. Some 2,400 such projects which hindered navigation have been built on rivers all over the country and one-tenth of this construction involves the main waterways. The uncoordinated construction of dams is probably a result of local government levels being in control of all inland waterways except for the Chang Jiang. For instance, Guangdong province reportedly lost 3,300 kilometers of navigable waterways between 1975 and 1980 because some counties in the Xi Jiang drainage basin built dams without shipping locks. Further upriver, a general survey conducted by Guangxi's communications department found that of the more than 90 navigable rivers in Guangxi province, shipping on 25 was being impeded by hydroelectric stations and other man-made barriers.

But even the Chang Jiang, subordinate to the Ministry of Communications, presents a striking example of how short-term difficulties caused by modernization have resulted in major disruptions in the flow of bulk commodities. The navigable upper portion of the river was cut off from the lower portion in early January 1981 when the main navigation channel was closed by a cofferdam at the Gezhouba hydroelectric project near Yichang in western Hubei. The densely populated areas of the Chang Jiang basin extensively utilize Chang Jiang shipping to move commodities—a practice temporarily disrupted by this modernization project. This disruption occurred less than a year after eight Chang Jiang ports[4] were opened to direct foreign trade—partly in an effort to relieve transshipment strains on the overburdened rail system and docking facilities at coastal ports. Although a temporary transshipment point was established at Yichang to ship cargo via circuitous rail and road routes to the north and south, the additional freight normally shipped through this section of the Chang Jiang probably expanded the volume to a level that far exceeded the capacity of these alternate routes.

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[3] For 1979 and 1980, sources other than the State Statistical Bureau have further reduced the length to 108,000 kilometers—an excessive reduction not yet explained or repeated by the State Statistical Bureau.

[4] They are Nantong Zhengjiagang, and Nanjing in Jiangsu Province, Wuhu in Anhui Province, Jiujiang in Jiangxi Province, Wuhan in Hubei Province, Chenglingji in Hunan Province, and Chongqing in Sichuan Province.

Although the immediate economy of the area was disrupted, the Gezhouba hydroelectric project, scheduled for full operation in 1986, will provide long term benefits for the area. One benefit for the transport sector is improved shipping conditions on the upper Chang Jiang. The dam will improve the difficult navigation channel through the rough waters of the Three Gorges by backing the water up for 100 kilometers upstream. The dam itself has three shipping locks, two for 10,000-ton ships and one for 3,000-ton vessels, with an estimated through shipping capacity of 30 million tons per year when fully operational. The large locks were opened to traffic in late June 1981; the smallest lock is still under construction. An additional benefit, a railway and a highway to be built on top of the dam, will provide a crossing point for north-south ground transport.

The inland waterway sector, in addition to the usual maintenance work required to maintain the channels, ships, and ports, has undergone limited modernization and expansion which has enhanced the network over the past decade. Increased dredging operations have improved navigational depths, larger ships and barges have increased carrying capacity, mechanized loading and unloading facilities have streamlined operations, and new and expanded port facilities have raised overall port capacity. The bulk of past improvement efforts have been directed at the Chang Jiang system, and a major portion of future efforts also will likely center on the Chang Jiang. Twenty-five ports and over 270 small harbor stations and wharves have been placed in operation along the Chang Jiang. Ships in the 10,000-ton class can reach Nanjing, 5,000-ton ships can sail to Wuhan, and 1,000-ton barge fleets can travel beyond Chongqing, more than 2,000 kilometers from the mouth of the river.

Over the next 10 years, the Chinese hope to further strengthen and develop the main sections of selected inland waterways. On the Chang Jiang they hope to more than double the current volume of freight shipments mainly through port expansion projects, especially for ports downriver from Nanjing where 30 more deepwater berths are planned. On the Xi Jiang between Guangzhou and Nanning, and on the eastern section of the Huai He, they plan to improve navigational conditions to meet operational standards for 1,000-ton barge fleets. However, to update the total inland waterway system to an adequate, fast moving, mechanized water transport system would cost more than the Chinese have spent or will be willing to spend in the near future.

Although past capital improvements on the inland waterways have been slow because of insufficient funding, traffic on the inland waterways has increased. Basic construction investment on waterways other than the Chang Jiang over the past 30 years amounted to only about one-fortieth of railroad investment. And yet, the water transport sector has been steadily accounting for a larger share of the nation's freight turnover. In the last four years alone, waterway freight turnover has increased its share of the total turnover by about 10 percent. The waterways have been able to improve their performance more rapidly than the railroads for two reasons. First, the load-carrying capacity for tons per horsepower on the waterways is three times that of the railways. Second, improvement and maintenance of a waterway costs only one-third to one-fifth the cost of building and maintaining a new railway of the same length.

Modernization efforts have also raised the capacity of China's major coastal ports.[5] Some 320 berths, of which 135 are for deepwater vessels of 10,000 tons or better, and a number of special cargo wharves are now operational with more under construction. Nearly a third of all existing berths and 50 of the deepwater berths are located in Shanghai—China's most efficient all-round port with each work area handling specific types of cargo such as general cargo, containers, grain, oil, and coal. In general, coastal ports north of Shanghai, the most highly mechanized port, are better equipped with mechanical handling facilities than those to the south, with two exceptions—Huangpu and Zhanjiang.

Overall mechanization levels at Chinese ports, according to recent claims, have increased to where mechanized equipment can now handle some 80 percent of all loading and unloading operations. Over the past decade, construction and development efforts have been centered on improving the flow of bulk commodities and specialized cargoes. Bulk grain handling facilities have been mechanized at Dalian, Shanghai, and Huangpu. A high degree of specialization in bulk oil handling has been developed at Dalian, Qinhuangdao, Qingdao, Shanghai, and Zhanjiang. Modern coal handling facilities such as automatic loaders and conveyor systems having been installed at six ports—Qinhuangdao, Yantai, Qingdao, Lianyungang, Shanghai, and Huangpu. Salt handling wharves at Xingang and Lianyungang have been automated. Containerization, a fairly recent development at Chinese ports, has been concentrated at Xingang, Shanghai, and Huangpu. Containerization has been introduced to only a few other selected ports.

Much has been done to modernize China's harbors. Facilities have been expanded and new port areas have been constructed to handle larger vessels. Dredging operations have increased the number of deepwater berths for oceangoing ships. Improved mechanized handling facilities have tended to shorten the turn-around-time in some ports. Special handling equipment for bulk cargoes has been built, and at selected ports, container operations have been introduced. As a result, cargo handling capacity was nearly doubled between 1972 and 1980. Despite these improvements the coastal ports still cannot fully meet the demands of the national economy.

B. INLAND AND OCEANGOING FLEET

In addition to port and inland waterway improvement projects of the 1970s, the Chinese undertook an impressive fleet development program primarily aimed at eliminating China's dependence on chartered foreign vessels. As a result, China rapidly expanded both its domestic shipbuilding programs and its purchase of both new and second hand vessels on the world market. Excluding the Chinese controlled Hong Kong-registered fleet of about 2 million dwt, China's international merchant fleet totaled 7.9 million dwt at the end of 1980—10.6 times the 1970 tonnage. The international fleet now carries 70 percent of China's seagoing foreign trade tonnage as compared to less than 25 percent in 1970. The 1980 domestic fleet of about 3 million dwt remains about two-fifths the size of the larger international fleet. In shipbuilding, China's shipyards turned out 818,000 tons in new ships in 1980—an increase of 29 percent over 1977.

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[5] The Ministry of Communications lists 15 major ports: Dalian, Yingkou, Qinhuangdao, Tianjin (Xingang), Yantai, Qingdao, Lianyungang, Shanghai, Ningbo, Shantou, Huangpu, Zhanjiang, Haikou, Sanya (Yaxian), and Basuo (Dongfang).

In the first half of the decade, general cargo ships accounted for nearly all the international fleet tonnage, but by the end of the decade, China had achieved a more balanced mix of cargo vessels. As grain imports grew during the later part of the decade, the Chinese began acquiring an increasing number of dry-bulk carriers. By 1980, dry-bulk and general cargo vessels had about an equal share of the fleet tonnage. Tanker tonnage—estimated at about 10 percent of the total—has been declining, probably due to China's lack of a deepwater berth capable of handling super-tankers and its limited involvement in the international oil trade. Dalian—China's largest oil port—can handle only up to 100,000-ton tankers. Container ship tonnage as a percent of total tonnage is small since China only recently began building and purchasing container vessels. The container fleet, however, is expected to grow steadily during the next ten years as China seeks to increase transportation efficiency by shortening turn-around-time and reducing the cost of loading and unloading ships.

Most of the 3 million dwt domestic fleet is employed in coastal shipping. In addition to traveling coastal routes, coastal vessels in the 10,000 dwt class are used on the short section of the Xi Jiang between Huangpu and Guangzhou and the longer 400 kilometer section of the Chang Jiang between Shanghai and Nanjing. As a result of the U.S. Seventh Fleet control of the Formosa Strait for almost three decades, the coastal fleet was broken down into two main operating units—the northern coastal fleet and the southern coastal fleet. Even though the strait is now open to shipping, the north-south division of the fleet is generally still maintained. Cargo ships of 10,000 dwt and less are still the most common type vessel in the coastal fleet, but coastal tankers in the 20,000 to 25,000 dwt class also operate between coastal ports. A variety of smaller sized vessels under provincial control for which total tonnage is not known also operate along the coastal routes.

The inland waterway fleet—for which no accurate inventory exists—is comprised of vessels ranging from small wooden junks to modern vessels in the 5,000 to 8,000-ton class. The operating efficiency of the waterway fleet has gradually been improved by the addition of new vessels which are faster and larger. This is most apparent on the Chang Jiang—the chief recipient of inland waterway modernization efforts—where the addition of modern push tugs and barges have helped raise the shipping volume on the river.

Shipyards also have been undergoing modernization efforts aimed at meeting the demands of both the domestic and international shipping markets. The Chinese are capable of building a wide variety of ships from small fully mechanized 1,500-ton colliers to large 60,000-ton oceangoing freighters. Shipyards also are busy turning out tugboats as large as 9,000 horsepower and oil tankers up to 50,000 tons. Current production capabilities are being expanded to produce 100,000-ton ships with an eventual goal of 150,000-ton vessels. Presently, the Chinese are building 20,000 to 30,000-ton vessels for export and they have orders for a few 60,000-ton vessels. In addition to building container ships, shipyards also have entered into compensatory trade agreements with foreign companies for manufacturing international 20- and 40-foot containers. The first operational container factory began production at Guangzhou shipyard in the fall of 1980. Other container factories are under construction or planned for shipyards at Tianjin, Shanghai, and Guangzhou.

C. TRAFFIC AND OPERATIONS

In the last decade, water transport has been growing rapidly with freight turnover increasing at an annual rate of 14.1 percent—twice the growth rate for rails and nearly triple the highway rate. Between 1970 and 1980, the performance of water transport units under the Ministry of Communications increased from 135 to 505 billion ton-kilometers. For tons originated, the overall picture is not very clear. The 1980 transport plan did call for water to handle 27.1 percent of the total tonnage originated by modern transport.

There is a deficiency of information on tons originated for the total water sector during the past decade. However, performance data for selected portions of the water transport sector reflects the steady growth in the volume of water shipments. For example, during the first six months of 1980, the Chang Jiang Shipping Administration set an all time high by moving 23 million tons of freight—up 6.8 percent over the first half of 1979. Freight volume during the second half of 1980, not yet reported by the Chinese, is expected to be lower than first half data as increased construction activity in the main channel in preparation for closing the channel at the Gezhouba hydroelectric site probably began interfering with through traffic months before the actual closure.

Cargo handling capacity, as a reflection of the progress made in modernizing Chinese coastal ports, was nearly doubled between 1972 and 1980—from 120 to 217 million tons. The largest increase in capacity occurred in 1978 when 38 million tons was added mostly as a result of the completion of a number of the projects begun in 1973. After this big increase, the rate at which new port capacity was added began to drop dramatically. In 1979, the ports picked up an additional 15 millions tons of capacity, but in 1980, Chinese port capacity grew by only 2 percent or 4 million tons—well below the 15 percent annual growth rate achieved during the previous two years.

Deterioration in Chinese port operations, especially in the last two years, can be attributed in part to a sharp rise in foreign trade, growth of the maritime fleet, mechanization and specialization in port areas, and expanded production and construction in both industry and agriculture along with regional changes in commodity production. Major ports showed a 44 percent increase in import-export trade for the first half of 1979 over the same period of 1978 and the amount of cargo has continued to increase since then. Earlier, the Chinese noted that a 66 percent increase in cargo-handling capacity during the 1972 to 1979 period fell short of the 107 percent increase in foreign trade. In addition to the rapid growth of China's international merchant fleet—40 percent growth in tonnage since 1977—the number of foreign ships entering Chinese ports has been growing rapidly as a result of expanding commercial relations. Since 1971, the Chinese have signed 20 additional maritime shipping agreements including one with the United States in 1980.

The Chinese are finding it difficult to move this larger volume of cargo into and out of port areas due to the inadequacy of the transportation and distribution networks that serve the ports. Specialized port facilities and mechanized equipment have speeded up cargo-loading and -unloading faster than improvements have been made to port supporting infrastructures. The rapid growth in containerization is one example of port modernization outpacing the inland transport networks. China's ports handled five times as many international containers in 1980 as in 1978, however, international containers, due to their size, cannot be moved easily over the present rail and road networks. As a result, containers are being packed and unpacked within port areas—a practice that reduces the economic advantage normally gained with rapid inland movement of containerized goods. Shifts in transport demands caused by regional changes in commodity production also are affecting port areas. With the current emphasis on light industry, many of the coastal cities are having a resurgence of industrial activity—an activity producing light weight products that occupy more space per pound than heavy industry products. Then too, the recent move towards development of larger more economical coal mines in north China and away from coal production south of the Chang Jiang will increase demands for coal transshipments from north to south.

Heavy bulk commodities that are most economically suitable for slow travel over long distance account for the largest portion of water shipping volume. Coal is the number one bulk commodity, shipped primarily from the northern coal ports south along the coast and also up the Chang Jiang. For example, more than three-quarters of the coal used to fuel Shanghai's power plants arrives via water. Like coal, much of the southern movement of China's domestic crude oil originates with the loading of coastal tankers at the northern oil ports and terminates at the southern coastal and inland river ports. Raw materials for both the iron and steel, and construction industries account for significant shares of water tonnage. Food grains, chemical fertilizers, and timber are some other high volume commodities that move by water—especially down the Chang Jiang from the Sichuan basin.

VI. Civil Aviation

A. NETWORK

During the 70's, China expanded and reequipped its domestic and international civil air service. Its single airline, Civil Aviation Administration of China (CAAC), grew rapidly, apace with China's increased political and economic contacts with foreign countries. Until 1973, CAAC's international route network was confined to the USSR, North Korea, North Vietnam, and Burma. Since 1974, when China joined the International Civil Aviation Organization (ICAO), service to foreign countries has been steadily increasing, China has aviation agreements with nearly 40 countries and CAAC has established business connections with more than 180 airlines throughout the world. CAAC now provides regular service to 17 countries. Its service stretches from Japan across the Pacific to the United States, and from South Asia to Eastern and Western Europe and to Africa. The total length of international and domestic routes totals around 190 thousand kilometers. Within China, approximately 160 domestic routes—up from 75 routes in 1971—cover some 109 thousand kilometers and connect over 80 cities. CAAC operates more than 500 scheduled flights a week, including flights established to accommodate the rapidly expanding number of foreign visitors.

To support this expanded network, airport facilities and associated services are being improved. Beijing, the largest of the international airports and the hub of the aviation network, rebuilt its terminal, enlarged one runway, and added another in preparation for the expected rise in wide body jet traffic. Beijing now handles some 70 international flights a week. Shanghai and Guangzhou, the largest airports primarily used by foreign businessmen and tourists, are slated for additional expansion. During an earlier program, Urumqi airport in Xinjiang was expanded and now is classified as an international airport capable of handling large jet aircraft.

Additional airports for handling wide-body jets are scheduled for expansion, are under construction, or have been completed. A new airport at Wuhan in Hubei Province, capable of handling the Boeing 747SP, is to be constructed. The airports at Tianjin and Hefei have been upgraded to serve as alternate airports for Beijing and Shanghai, respectively. In 1979, a new jet airport was completed at Harbin after four years of construction efforts. The Chinese also have indicated that the airports at Changsha, Fuzhou, Dalian, and Chengdu must be expanded to handle larger jetliners.

B. CIVIL AIRCRAFT FLEET

The Chinese penchant for multiple suppliers and earlier reliance on the USSR have given CAAC one of the world's most varied air fleets. The fleet employs some 20 different types of aircraft, many of them obsolete in terms of today's technology. CAAC service began with Soviet aircraft; Russian AN–12s, AN–24s, IL–14s, IL–18s, and IL–62s still comprise a large portion of its fleet. In 1970, China began looking to western suppliers to broaden sources of equipment and to enhance the prestige of CAAC with firstline Western equipment. Up until this point, the fleet consisted mostly of piston-driven, propeller aircraft. In the early 70s, at the same time that they were purchasing the Russian IL–62s, CAAC's first long-range jet aircraft, the Chinese purchased their first medium-range British built Trident jets. Since then, the Chinese have acquired more than 30 Tridents—models 1E, 2E, and 3E—mainly for domestic flights and a number of long-range Boeing 707s mainly for use on the international routes. In 1980, the Chinese acquired 3 long-range widebody Boeing 747SPs in an attempt to compete with foreign airlines on a more even footing. These three widebody jets are used mainly on the United States and Western Europe runs.

In addition to passenger-cargo aircraft, the Chinese employ a number of aircraft in specialized aviation services. The Chinese built YUN–11, a twin-engine piston driven aircraft, is heavily used as an agricultural and forestry support aircraft. The Chinese single-engine general purpose Y–5 is a piston driven aircraft used for both agricultural support and as an aerial ambulance in addition to its use as a small field passenger-cargo aircraft.

C. TRAFFIC AND OPERATIONS

Though providing a number of specialized services, civil aviation's contribution to the total transport sector is minor when compared with rail, water, and road services. The volume of cargo is small and passengers are mostly government officials and foreign visitors. China has, nevertheless, expanded cargo and passenger volume on both domestic and international flights. In the last decade, air freight turnover has developed at an annual rate of 18.9 percent. Between 1977 and 1980, freight turnover increased at a near steady rate, averaging 22.9 percent a year—from 76 million ton-kilometers to 141 million ton-kilometers in 1980. During the same four year period, passenger turnover grew at a slightly faster rate of 29.8 percent a year as turnover increased from nearly 2 billion to 4 billion passenger-kilometers. At least part of this growth in passenger transport can be attributed to the increasing number of tourists converging on China since the country was opened to tourism in 1977. Some of the freight increase is a result of China's recent entry into the field of containerized air shipments.

TABLE 3.—CHINA: CIVIL AIR PERFORMANCE

Year	Freight turnover (million ton-kilometers)	Passenger turnover (million passenger-kilometers)
1970	25.0	349.0
1975	49.7	1,114.3
1977	75.9	1,830.0
1978	97.0	2,790.0
1979	123.4	3,500.0
1980	140.6	4,000.0

Sources: 1970, 1975: Estimated. 1977: Freight turnover derived from reported 27.8 percent increase between 1977 and 1978, FBIS, June 27, 1979, L-16. 1977–79: Passenger turnover reported in SSB, 1981, p. 6. 1978: Freight turnover from FBIS, June 27, 1979, L–16. 1979: Freight turnover from FBIS, Apr. 30, 1980, L–6. 1980: Freight and passenger turnover from FBIS, Apr. 29, 1981, K–11.

The present CAAC fleet is underutilized. Currently, Chinese aircraft fly about two hours a day, whereas in most industrial nations the average is about 10 hours a day per plane. Management practices, as well as the small number of qualified civil aircraft pilots, probably account for the underutilization rate rather than a poor maintenance program. Although the Chinese pool of trained manpower is small, current capabilities to perform routine maintenance could support additional flight time. Scheduled overhauls on jet-powered aircraft present no problem as they are generally contracted out to foreign based firms. For instance, scheduled overhauls for their Boeing 707 aircraft have been done under contract by a Hong Kong based firm since 1973. Maintenance on the older piston-engine aircraft and turboprop-powered aircraft is done by the Chinese in China.

Air traffic control facilities are adequate for the amount of daily traffic currently handled, less than 1 percent of the volume handled daily in the United States. However, modernized traffic control facilities will be required when the utilization rate of CAAC's current inventory increases and as more modern jets use China's airspace. At its most modern airports, China has conventional avionics and flight control equipment capable of handling current traffic volume. For example, Shanghai airport, with a non-directional beacon, an instrument landing system, and a precision approach radar, handles only about 120 aircraft movements a day. Whereas most of the large airports have a precision approach radar, only the largest airports have an instrument landing system. At the smaller airports, rudimentary enroute navigational aids and airport control facilities now generally limit operations during periods of darkness and bad weather.

VII. PIPELINES

China's scattered network of pipelines, both oil and gas, is a fairly recent development as the bulk of the lines were completed in the mid to late 70s. Today, there are some 6,800 kilometers of oil pipelines and around 1,000 kilometers of natural gas pipelines in China. Most of the oil pipelines provide direct oilfield to refinery links or oilfield to port links that have greatly reduced if not eliminated the need for rail shipments. In the west however, the oil pipelines link the oilfields to distant railheads, whereby only reducing the rail distance of crude oil shipments. Nationwide about 80 percent of crude oil production is transferred by pipeline; the railroads carry the remainder along with most of the refined production. Before 1980, little was known concerning crude oil shipments via pipelines. In 1980 the SSB published figures for the amount of oil and gas carried by pipelines: 38.7, 41.9, 47.6, and 49.1 billion ton-kilometers for 1977 through 1980, respectively.

Pipeline construction has been directed at eliminating transportation bottlenecks that have long hampered energy transfer in China. In the north and northeast, some 4,000 kilometers of pipelines form a crude oil export network that supplies the refineries and oil ports of north China. In the northwest, pipelines link the two main oilfields, Karamay and Yumen, with railroads on the Urumqi-Lanzhou rail line. An additional 300-kilometer oil pipeline is being laid between the Karamay oilfield and the railhead at Urumqi in Xinjiang province. With the 1980 completion of the Golmud-Lanzhou railline, the 1,100-kilometer Qinghai-Xizang oil pipeline is linked to a railhead thereby eliminating truck transshipments from rail terminals on the Urumqi-Lanzhou rail line. The Qinghai-Xizang pipeline is one of the few lines that does not link up with an oilfield. Another non-oilfield related pipeline of 115 kilometers was completed during 1980 in southern Guangdong province to distribute oil imports. Natural gas pipeline networks are restricted to Sichuan province. Here some 1,000 kilometers of natural gas pipelines connect dozens of small gasfields with end users and more lines are under construction.

VIII. PASSENGER TRANSPORT

In a country of 1 billion people, the movement of people from point to point creates a huge demand for public transportation and at times conflicts with the movement of freight. In 1980, passenger turnover by all means of modern transport totaled 228.1 billion person-km/km, up 44 percent since 1977. Like turnover in the freight sector the railroads are the predominant form of transport used by people. Railroads now handle 61 percent of the passenger turnover compared to 50 percent of freight turnover. Most passenger travel covers only short distances with the average rail traveler riding less than 150 kilometers. Of this travel, about 70 percent is within a single regional railway administration, 20 percent is urban area travel, and the remaining 10 percent is long distance traffic. In 1980, rail passenger density stood at 2.6 million passenger-km/km, up 22 percent over 1977. To handle increased demand, nearly 800 daily-scheduled passenger runs were operating by the end of 1980. These additional passenger runs have increased rail congestion; as a result both passenger and freight trains now are operating at reduced speeds. On some high density lines, passenger traffic is at capacity and no additional passenger trains can be added without a loss of freight traffic. The lack of an adequate number of passenger cars, 17,000 in 1980, is an additional hindrance to expansion of passenger service. The Chinese plan to produce over 1,100 passenger cars in 1981, however, most of these cars probably will go as replacements, for with the level of current congestion there is little room for additional passenger trains. Thus, the overcrowding, poor service, and long waits in unsuitable waiting areas that characterize Chinese rail travel will continue to exist until the modernization efforts now underway free up some track space for additional trains.

TABLE 4.—CHINA: PASSENGER TURNOVER

[In billion passenger-kilometers]

Mode of transport	1977	1978	1979	1980
Total	158.38	174.06	196.60	228.10
Rail	102.00	109.10	121.40	138.30
Road	44.80	52.11	60.30	72.90
Water	9.75	10.06	11.40	12.90
Air	1.83	2.79	3.50	4.00

Sources: 1977-79: SSB, 1980, pp. 6-7. 1980: FBIS, Apr. 29, 1981, K-7.

Comparing the average annual growth rate of passenger traffic since 1977, the air sector had the highest growth rate, 29.8 percent a year, followed by the highway sector with 17.6 percent. There was slower growth in rail and water travel, 10.7 percent and 9.8 percent a year, respectively. The growth in the Chinese population, slowly-rising personal incomes, some of which is being spent on travel, and the opening up of China to foreign tourists are the principal reasons behind the growth in passenger turnover. Although the full magnitude of in-country tourist travel is not known, one scenic spot in Jiangsu province gives an indication of the growing number of local travelers. During the first 9 months of 1980, some 15 million mainland Chinese visited this spot. Probably more significant, because they are adding to China's foreign exchange income, is the rapid growth in foreign tourists, more than a 300 percent increase over 1977.

Although slightly less than 20 percent of the estimated 1.1 million foreign tourists received in 1980 were of non-Chinese extraction, this group probably is the one responsible for the rapid growth in air and road travel. In the air sector, a number of new routes were added specifically to serve foreign tourists. On the ground, a number of cities reported the acquisition of new buses and taxis, many just for the tourist trade. For example, Beijing had 1,800 taxicabs and over 3,000 buses by 1980 and had opened some new bus routes to scenic areas. Although 350 of these buses were added in 1979, Beijing's public transport system in 1980 was hard pressed to handle its more than 6 million daily riders and at the same time provide expanded tourist services. The rail and water sectors are less affected by foreign tourists because they are small in number compared to the large number of Chinese riders. However, China plans to double the number of foreign visitors by 1985 and also to expand the number of areas open to foreign travelers. Thus, there will be an increased demand on these sectors from foreign travelers as well as from the mainland Chinese.

IX. PROSPECTS FOR THE 1980s

Toward the end of the 70s, the Chinese were openly admitting the importance of the overall impact of transportation on the economic development and modernization of China. In early 1979, the Chinese began to readjust national development priorities. Though a number of whole plant projects had been cancelled and some local projects cut back or abandoned by 1980, most transport projects were on or near schedule. During the 80s, the Chinese are expected to continue to give some priority to selected transport projects as they follow their "four point policy"—readjusting, restructuring, consolidating, and improving. Transport facilities related to energy, foreign trade, and the tourist industry probably will receive the greatest emphasis.

The modernization projects now underway or planned for water and rail in North China will, in most cases, be barely sufficient to meet modest increases in economic needs. The upgrading of rail lines and ports serving the coal areas of North China are expected to be completed by 1985. Double tracking and electrification of the high density lines carrying Shanxi coal to ports in Hebei and Shandong province, also undergoing expansion, will greatly increase the coal handling capacity in this area. However, these projects are geared mainly at meeting current needs, and as a result, will have little spare capacity to handle future economic growth. In 1979, for example, when construction was just starting on some of these projects, Shanxi province, the single largest coal producing area, had over 10 million tons of coal stockpiled because of limited capacity of railways.

During the 80s, China's coastal ports as well as the foreign trade ports on the Chang Jiang will continue their expansion programs. The shortage of capital construction funding from the national level is not expected to seriously hamper port construction. Except for major expansion projects, Chinese ports can plan and carry out building projects that are funded by port earnings. Throughout the 80s, the Chinese are expected to continue increasing both port capacity and the number of specialized cargo facilities. The biggest problem affecting port operations will be the length of time needed to improve the vastly inadequate transport networks serving the port areas. Rail service is not in as bad a shape as the road service and should be able to increase capacity well before the end of the decade. The highway sector, on the other hand, is so far behind that it will require a major overhaul probably extending throughout and beyond the 80s. Roads serving port areas have to be widened, bridges have to be strengthened, both larger and more specialized trucks have to be acquired, and the trucking departments have to coordinate and improve their overall operations.

In the air sector, China's civil airline is expected to continue expansion on both domestic and international flights as it attempts to increase foreign exchange earnings by increasing tourist carrying capacity. Since the Chinese still are having problems providing the high quality service that western travelers expect, additional effort will be needed to bring its operations up to levels approaching those of western airlines. As operations and services improve and as earnings increase, the Chinese most likely will begin supplementing their air fleet with medium-range jet aircraft purchased from western sources.

Since the Chinese transport sectors historically have been in a catch up mode, China's transportation infrastructure will be hard pressed to support overall modernization efforts and in most cases will be able to do little more than stay even with rising demands. During the 80s the speed of modernization of the transport infrastructure will be limited by a number of factors. Given the vastness of the country and the current status of transport systems, to fully modernize all transport types would require large amounts of capital investment. Because of the competition with other sectors of the economy for new resources, investment in transport will be limited and what funding is available probably will be directed towards improving transport service to those areas most capable of earning foreign exchange—the coal industry, port complexes, and tourism. Another factor affecting modernization, especially in the rail and highway sectors, will be the availability and types of energy supplies. Both the vastness of coal resources and the large inventory of steam locomotives are evidence that steam traction will remain the predominant locomotive source during the 80s. Dim prospects for petroleum production probably will limit increases in diesel fuel and restrict the spread of diesel locomotion. On some high density rail lines that require a greater hauling capacity than steam can provide, the Chinese probably will skip the diesel phase and go directly to electric traction. The availability of energy supplies also will determine the speed and direction of modernization in the highway sector. Here, the number one question will be whether or not the Chinese can improve the gas mileage of the current fleet and at the same time begin building a replacement pool of diesel powered trucks.

And finally, a factor that affects all modes of transport, the willingness and ability of transport personnel to institute modernization changes. For a number of years to come, the Chinese will be busy raising the technical level of the transport labor force which, like other sectors of the economy, was hard hit by the closing of educational institutions during the Cultural Revolution. The past emphasis on self-sufficiency that allowed the various transport sectors as well as individual departments to operate independently also must be changed. The successful operation of a modern transport net is highly dependent on close coordination of the various systems.

TABLE 5.—CHINA: RAIL, ROAD, AND WATER TRANSPORT PERFORMANCE IN SELECTED YEARS

[In metric units]

Mode of transport (and measurement units)	1952	1957	1965	1970	1975	1977	1978	1979	1980
RAIL									
Ton-kilometers (billion)	[1] 60.2	[1] 134.6	[2] 201.1	[2] 284.7	[2] 417.7	[1] 455.7	[1] 533.3	[1] 558.8	[3] 571.7
Tons originated (million)	[1] 132.2	[1] 274.2	[2] 407.9	[2] 575.2	[2] 839.7	[3] 914.9	[4] 1,070.0	[5] 1,120.3	[5] 1,145.2
Average length of haul (kilometers	[1] 455.4	[1] 490.9	[2] 492.8	[2] 495.0	[2] 497.2	[2] 498.1	[3] 498.4	[4] 498.8	[4] 499.2
ROAD									
Ton-kilometers (billion)	[1] 1.4	[1] 4.8	(*)	[2] 16.1	[2] 21.6	[1] 25.1	[1] 27.4	[1] 26.8	[3] 27.5
Tons originated (million)	[1] 40.2	[1] 101.9	(*)	[2] 341.9	[3] 458.7	[4] 533.8	[1] 583.0	[4] 570.2	[4] 585.1
Average length of haul (kilometers)	[1] 34.8	[1] 47.1	(*)	[2] 47.0	[2] 47.0	[2] 47.0	[2] 47.0	[2] 47.0	[2] 47.0
WATER									
Ton-kilometers (billion)	[1] 14.6	[1] 41.6	(*)	[2] 135.4	[2] 235.5	[1] 276.2	[1] 377.9	[1] 456.4	[3] 505.3
Tons originated (million)	[1] 19.7	[1] 65.0	(*)	(*)	[2] 349.9	[2] 388.6	[2] 432.9	[2] 432.3	[1] 459.4
Average length of haul (kilometers)	[1] 740.9	[1] 639.6	(*)	(*)	[2] 735.8	[2] 710.8	[2] 873.0	[2] 1,055.8	[2] 1,100.0

*Not available.

SOURCES

Ton-kilometers:

Rail:

[1] SSB, 1980, p. 6.

[2] Derived by multiplying tons originated by average length of haul.

[3] FBIS, Apr. 29, 1981, K-11.

Road:

[1] SSB, 1980, p. 6.

[2] Derived from tons originated multiplied by average length of haul.

[3] FBIS, Apr. 29, 1981, K-11, only the 2.6 percent increase was used as the reported ton-kilometers is almost 3 times the 1979 figure.

Water:

[1] SSB, 1980, p. 6.

[2] Derived from water transport's share of water, road, and rail turnover being 23 percent in 1957 and 37 percent in 1975 and assuming a steady 2.34 percent annual growth rate between 1957 and 1975.

[3] FBIS, Apr. 29, 1981, K-11.

Tons originated:

Rail:

[1] "TGY," p. 146.

[2] 1959–76 derived by estimating that 65 percent of coal production accounted for 37 percent of rail volume. Percent of coal production carried by rail was 65.9 percent in 1958 and 64.8 percent in 1978. Coal accounted for an averare 37 percent of rail volume in the 1955 58 period (JPRS 3484, July 6, 1960, pp. 72–73, A. I. Il'yin and M. P. Voronichev, "Railroad Transport of the Chinese People's Republic" Moscow 1959, translated) and in 1978 was 37.4 percent of rail volume ("International Railway Journal", November 1979, p. 66). Average annual growth rate for coal production between 1958 and 1978 was 5.1 percent while the growth in rail volume, 5.3 percent per year, was similar for the same period. (For coal production see CIA, "China: Economic Indicators ER 78-10750," December 1978, p. 22 for 1955–74 and CIA, "Handbook of Economic Statistics 1980, ER 80-10452, October 1980, p. 131, for 1975–79.)

[3] Derived from turnover in 1977 divided by the average length of haul.

[4] FBIS, June 18, 1979, L-15.

[5] Derived from turnover divided by average length of haul.

Road:

[1] Turnover divided by average length of haul.

[2] Derived from 1971 figure (reported as 42 times the highest preliberation figure, FBIS, Sept. 25, 1972) and the assumption that growth for 1971 over 1970 was the same as the 3 percent claimed for 1972 over 1971 (FBIS Mar. 19, 1972, B-4).

[3] Derived from claimed 4-percent increase of 1976 over 1975 (BBC, SWB FE/W922/A/10, Mar. 30, 1977) and the 11.9-percent increase between 1977 and 1976 (BBC, SWB FE/W963/A/13, Jan. 18, 1978).

[4] Derived from turnover divided by average length of haul.

Water:

[1] Turnover divided by average length of haul.

[2] MOC.

Average length of haul:

Rail:

[1] "TGY," turnover divided by tons originated, pp. 148 and 146.

[2] Based on assumed average length of haul growth of 0.44 km per year, 1960–77.

[3] Turnover divided by tons originated.

[4] Assumed 0.4 km growth in average length of haul.

Road:

[1] Derived from turnover divided by tons originated, "TGY," pp. 148 and 146.

[2] Estimated.

[3] JPRS 77665, Mar. 25, 1981, p. 77.

Water:

[1] Derived from turnover divided by tons originated, "TGY," pp. 148 and 146.

[2] MOC.

TABLE 6.—CHINA: TRANSPORT NETWORK LENGTH IN SELECTED YEARS

[In thousand kilometers at yearend]

Mode of transport	1952	1957	1965	1970	1975	1977	1978	1979	1980
Railroad	[1] 24.5	[1] 29.9	[2] 35.9	[2] 41.3	[2] 48.0	[1] 49.5	[1] 50.4	[1] 51.5	[3] 52.4
Highway	[1] 126.7	[1] 254.6	[4] 550.4	[2] 640.0	[2] 785.0	[1] 855.6	[1] 890.2	(5)	(5)
Inland waterways (navigable)	[4] 95.0	[1] 144.1	[6] 161.5	[6] 149.3	[6] 140.5	[1] 137.4	[1] 136.0	(7)	(7)
Air (domestic and international)	[1] 13.1	[1] 26.4	[2] 36.9	[8] 45.0	[2] 91.4	[1] 132.1	[1] 148.9	[1] 160.0	[9] 190.0

[1] SSB, 1980, p. 6.

[2] Estimated.

[3] NCNA broadcast of Feb. 22, 1981, that 910 km of new railways were opened in 1980, (BBC, SWB FE/W1123/A/15, Mar. 4, 1981.

[4] Philip W. Vetterling and James J. Wagy, ''China: The Transportation Sector, 1950–71,'' Congress of the United States, Joint Economic Committee, ''People's Republic of China: An Economic Assessment,'' Washington, D.C., 1972, p. 178.

[5] Not available. China might possibly be reassessing its highway distances. No distance was given for 1979 by the SSB in 1980 (op. cit., p. 6) and conflicting distances for 1980 were given in other sources: 890,000 km (JPRS 77007, Dec. 16, 1980, p. 63.) and 875,000 km (BBC, SWB FE/W1117/A/9, Jan. 21, 1981.).

[6] Derived from reported 172,000 km for 1961 (Jingji quanli [Economic Management], No. 3, 1981, p. 14.) using a yearly decrease of 1.56 percent to reach the 147,000 km reported for 1971 (FBIS, Sept. 25, 1972, B-1). Between 1971 and 1977 a 1.12 percent decrease was used.

[7] Not available. Waterway distances also might be undergoing reassessment. No distance was given for 1979 by the SSB in 1980 (op. cit., p. 6.). Other sources gave a very low distance of 108,000 km for 1979 (Jingji quanli, 1981) and for 1980 (JPRS 76823, Nov. 14, 1980, p. 53.).

[8] Vetterling, p. 170.

[9] FBIS, Jan. 19, 1981

II. HUMAN FACTORS IN DEVELOPMENT

RECENT DEMOGRAPHIC DATA FROM CHINA: PROBLEMS AND PROSPECTS

By John S. Aird*

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I. SUMMARY

A major change has taken place since 1978 in the availability of national and provincial population data from China and in the policies of the Chinese government toward statistics in general. Under the principle of "learn truth from facts," statistical development has once again, after an interval of 15 years, been given high priority, and the regular publication of statistical data has been resumed after a lapse of 20 years. The new data include national population totals and vital rates for most of the 1970's and several sets of recent provincial population totals and natural increase rates. Age data are now available from the 1964 census, the 1976 cancer epidemiology survey, and an age composition survey of 1978. There are also national vital rates for the 1960's and a series of absolute birth totals that extends from 1950 to 1977.

Some of these data show a demographic impact from the food crisis of 1959–61 that is far more serious than most foreign observers had supposed. Chinese sources say that there was even a net loss of population in one of those years. The 1964 census reflects the loss in its low total, but the census age distribution shows too many persons at ages 0 to 4, the age group that should have been affected by lower birth rates and higher infant mortality rates. Hence there is a fundamental contradiction between the census total and the census age distribution. The 1976 age data imply a more severe population loss during the crisis than the 1964 age distribution but not as severe as the population totals and the birth totals series imply. The provincial data for 1964 show that a disproportionate share of the crisis population loss was borne by a very few provinces—mainly Sichuan, Anhui, and Gansu. It is likely that at least a part of the apparent loss was due to defective census work in some of the provinces in 1964.

Other doubts are raised by the extremely rapid declines in fertility and natural increase in the country as a whole and in some of the provinces between 1970 and 1980. Recent Chinese sources have been quite candid in discussing widespread falsification of statistical data in China, and several say that births are deliberately underreported in order to show success in family planning work. Falsification arises because of the desire of local officials to please their superiors by showing high achievement and the attainment of targets, quotas, and standards that are sometimes unrealistic. The main culprits in statistical falsification are the local Party and government leaders, who gain personal fame and advancement by falsification and apparently run very little risk of exposure. In part the fault lies with the upper level leadership who tolerate or create the conditions which lead to falsification at lower levels. Sometimes, most notably during the Leap Forward of 1958, even the national Party leadership has encouraged falsification by subordinating statistics to political control. The issue of the relationship of the statisticians to the Party has not yet been resolved. The statisticians are calling for the passage of a new law that will define their rights and duties in preventing statistical falsification by political leaders.

Concern about the reliability population data is one of the reasons why the Chinese leaders have decided to take a new census. But the census poses a threat of exposure to those local leaders who have falsified population data. The critical question is whether the census field procedures can be designed in such a way as to make sure that the census returns are immune from local manipulation before they are submitted for tabulation. The census is being planned with great care and with the benefit of foreign advice and experience. It has been postponed several times to allow more time for the establishment of the computer network and for additional field tests. The flexibility shown in the preparatory stages of the work is an indication of the seriousness of Chinese intentions to make sure that the census is well designed, organized, and executed so that the resulting data will be accurate. This census is much more complex than the censuses of 1953 and 1964. It will include many more questions, a more effective post-enumeration check for errors, and an elaborate system of computer data processing. The census has attracted worldwide attention because it is the largest census ever undertaken and is expected to provide answers to many of the long unanswered questions about China's population.

II. RECENT POLICY CHANGES

Since the last Joint Economic Committee report on China, a major change has taken place in Chinese policy on the release of demographic data. In 1978 no current official population total was available. From rounded provincial figures that had appeared in the press after Mao's death in 1976 it was clear that the official national total was well over 900 million, but some Chinese sources were still using the round figure of 800 million. A set of provincial population totals in units of 10,000 had appeared in several Chinese atlases in the early 1970's which could be added together to get a national total, but these figures, undated and unattributed, were apparently the results of the 1964 census and already seven years out-of-date when they were published. Apart from the atlas figures and the lagging round totals in hundreds of millions, there had been no formally announced official population total for China since the yearend 1957 figure given in the statistical compendium *Ten Great Years* in September 1959.

The change in policy seems to have occurred early in 1979. In May 1979, Chen Xian, Director of the State Statistical Bureau (SSB), told Dr. Courtenay Slater, Chief Economist of the U.S. Department of Commerce, then on a visit to Beijing, that the national total including Taiwan had reached 960 million by the end of 1977.[1] In the same month a group of Japanese visitors was given a more precise version of the same figure: 962,050,000.[2] At the end of June, the SSB's first statistical communique since 1959 gave a yearend 1978 population total of 975,230,000, also including Taiwan.[3] In July, SSB Deputy Director Li Chengrui, in Washington with a delegation of census planners from China, told staff members of the Census Bureau's Foreign Demographic Analysis Division that the SSB had a complete series of official population totals and vital rates going back to 1949, most of which would probably be made public when the SSB had finished adjusting them. Since then, the SSB's statistical communiques have regularly included national population totals without Taiwan. Other sources have disclosed national figures on age composition, sex ratios, vital rates, total fertility rates, expectation of life, infant mortality rates, causes of death, death rates by age, and urban population totals. Some of the recently released data refer back to the 1950's and the 1960's. Little by little the new releases have begun to fill out the picture of China's recent demographic history as the Chinese statistical authorities see it.

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[1] The figure was given to Dr. Slater during an informal discussion with Chen in the offices of the SSB on May 9, 1979. According to Chen, this was the first time that an American had been permitted to visit the SSB.

[2] KYODO News Agency, Tokyo, June 1, 1979. Foreign Broadcast Information Service (FBIS), No. 109, June 5, 1979, p. L11.

[3] SSB, Communique on Fulfillment of China's 1978 National Economic Plan, June 27, 1979, p. 10.

Local population data had been appearing in Chinese news dispatches with increasing frequency from the early 1970's, but the figures consisted mostly of natural increase rates cited in connection with family planning progress reports. There were also a few municipal figures, but provincial figures were rare. Within the past three years, provincial vital rates have begun to appear with greater regularity, and Chinese sources have provided complete sets of provincial population totals in units of 10,000 for 1978 and 1979 and natural increase rates for all provinces for 1978. News items from Beijing and Tianjin have provided statistical data on the population of their central cities and hinterlands and on population growth by natural increase and by migration.

For students of China's population, accustomed to long years of scarcity, the new access of data has had almost the force of an explosion. For the first time in their professional lives, they find that they can hardly complete a manuscript before it is rendered partly obsolete by new disclosures. They work in an unaccustomed atmosphere of sustained excitement. An added factor in the excitement is the resumption of contacts between foreign analysts and China's own statisticians and demographers, another important change in the past three years. Aside from the personal gratification these contacts have afforded, they have initiated an exchange of information and opinion that is extremely valuable to the participants on both sides and will, if it continues, contribute greatly to the understanding of population and population policy in China by foreign demographers.

The renewal of international contacts and communications is one facet of a rebirth of demography in China. The development of demography, once a "forbidden area" to Chinese social scientists, has been accorded high priority by China's present leaders. Demographic research and training centers are being established throughout the country; a number of persons with professional training in economics, sociology, and statistics have been reassigned to demographic work; national, provincial, and municipal population associations have been formed; a quarterly journal devoted exclusively to population has commenced publication; a number of professional conferences on population have been convened at which hundreds of papers have been presented or circulated; and demographic analyses and projections have had a direct impact on administrative and policy decisions. After 30 years of neglect, demography in China seems to be on the threshold of a golden age.

One reason why the prospects for demography seem promising is that the current Chinese leaders place a high value on gathering and analyzing statistical data of all kinds as a fundamental basis for policy and administration. The guiding principle is articulated in an old slogan to which Vice-premier Deng Xiaoping and his associates have given new meaning: "Learn truth from facts." This phrase has become the motto of the newly revitalized SSB, but it also connotes a more realistic approach to problems in many other fields. In statistical work it has led to a renewed interest in field surveys and investigations, to the systematic reconstruction of statistical organs and reporting systems destroyed by the Cultural Revolution, and to remarkably candid analyses in the public media of the causes of inaccuracies and falsification in statistical data, including demographic data.

The clearest indication that China's leaders set a high value on reliable statistics is their decision to take another population census. Rumors that China was planning a new census began to circulate in the spring of 1979 and were confirmed in May of that year by Chen Xian in his conversation with Dr. Slater. The new census is a far more ambitious undertaking than its two predecessors of 1953 and 1964. It is expected to include a much longer list of questions, delving into aspects of Chinese society and economy never before subjected to national inquiry. It is reported that the results of the census will be published in full, another striking departure from previous practice. The new census, now scheduled for July 1982, will require a large allocation of domestic resources in a period in which there are many other urgent demands to be met, but the data the census is expected to provide are considered essential to the planning and management of China's modernization program.

These developments have already considerably changed the way in which foreign demographers look at China's population. The new population data have caused a marked convergence in the once highly divergent foreign estimates of the size of the population. The convergence does not reflect any greater certainty about the reliability of Chinese recordkeeping and reporting systems or about the accuracy of the official figures but arises entirely from the fact that there is no longer any doubt as to what the current official figures are. Before they were released, some foreign analysts tended to keep their estimates and projections low in order to stay close to the round totals appearing in the Chinese news media. The newly released figures have eliminated the low estimates, since there is no reason to suppose that the official data would exaggerate the size of the population at a time when the leaders are doing all they can to minimize population growth. What divergence still remains among foreign estimates is due to differences of opinion about the margin of undercount in the official figures.

The issuance of the official vital rates for all of China and for the provinces for various years has also curbed some of the more extreme skepticism about the effectiveness of China's family planning and public health programs in reducing fertility and mortality. No one now seriously disputes the general conviction that fertility in China has declined to a level that is creditably low for a developing country. Moreover, the change in fertility has been so rapid as to be without precedent in world experience. On the other hand, even some foreign scholars who tended to accept the initial Chinese claims as almost 100 percent accurate now generally agree that there is a significant amount of underregistration of births and deaths in China. The remaining differences of opinion are over how much underregistration it is reasonable to infer.

Another consequence of the release of official data is that more attention is now being focused on anomalies in the data. Internal inconsistencies are nothing new in Chinese population data; they were a persistent problem for analysts working with the data from the 1950's, who spent much time speculating about their causes and trying to adjust the data to eliminate them. There were undoubtedly many other data problems, known to the statisticians in the SSB, which foreign analysts could not recognize because the data made public were not sufficiently detailed. Now that more data are available, not only for the 1970's but for earlier years as well, many more internal inconsistencies and implausibilities have come to light. As a result, the work of foreign demographers has taken on a critical cast which may strike Chinese scholars unfamiliar with Western traditions in demographic analysis as negativistic. Actually, the intent of the foreign analysts is quite the opposite, for another important consequence of China's decision to release data and to reopen scholarly contacts with the rest of the world is to enlist the support of foreign scholars of all kinds, including demographers, in a common effort to help China overcome the effects of her isolation from the mainstream of world scientific development. The demographers want to do what they can to assist their colleagues in the SSB and the new population research and training centers in identifying defects in China's demographic data as a first step toward improving population registration, survey, and census work in the future.

The analysis of Chinese demographic data must remain somewhat tentative for the time being because the detailed data needed for more definitive work are still being withheld and because the origin of many of the current figures is obscure. Without more information about China's past censuses, about the actual procedures used in maintaining the rural and urban population records, about the way vital rates are now being recorded and transmitted, and about the sources of recently published survey age data, it is not possible to carry out many kinds of analysis that would be most useful to China. But in view of the imminence of the next census and the Chinese statistical developments and demographic studies already under way, we have to make the most of the data and information at hand and hope for more hereafter.

III. THE NEW POPULATION DATA

What have the newly released population data told us about China's population that we did not previously know? Perhaps the most startling implications of the new data are that a net loss of population occurred in one or more of the food crisis years in the early 1960's, that there was a sharp upsurge in births and population growth in the middle 1960's and a secondary peak in the late 1960's, and that the birth rate decline of the 1970's was most acute during the middle years of the decade. The first two revelations were quite unexpected. Although most foreign analysts had assumed that the food crisis dealt a temporary setback to population growth, no one had seriously considered the possibility that the effects of starvation and undernutrition would have been severe enough to bring about a net decrease in population. The recovery from the crisis was thought to be fairly quick, but there was nothing in the Chinese media at the time to suggest that a major baby boom was under way. The official birth rates for the 1970's show a rather gradual decline between 1970 and 1973, a sharp decline between 1973 and 1976, and a marked slowing of the decline to the end of the decade. The curiosity in this case is that the most rapid decline occurred in the years when the so-called "gang of four" was subsequently alleged to have "sabotaged" birth control work and that the decline slowed after the "gang" were overthrown and the birth control campaign was greatly intensified. Besides these puzzling circumstances, there are some contradications in the data that give rise to doubts as to how adequately they trace the actual course of demographic change during the years in question.

Some of the apparent anomalies in Chinese population data may be due to errors introduced in the course of publication. Very few of the new figures came directly from the SSB. Some appeared in news dispatches, newspaper and journal articles, and scholarly papers presented at conferences. Some of the figures released through "unofficial" channels have subsequently been confirmed by the SSB, and others are either consistent with SSB figures or have been cited by authorities in a position to know what the official series contains. However, several figures that have been cited in "unofficial" channels do not seem to be consistent with the official data. The reasons for these anomalies are usually not clear. Chinese writers, including scholars contributing to journals, are not in the habit of documenting their sources in detail. Usually, it is not possible to determine the source of the figures they cite. With the sudden burgeoning of demographic research and publication in China, some scholars have begun to make their own estimates, combinations, and indexes, most of which have probably been based on official data but derived by methods that are not revealed. Hence some of the apparent discrepancies may actually be merely a reflection of the greater freedom now permitted to Chinese demographers in manipulating data in the process of analyzing them. In a few cases the anomalies may be due to inadvertent errors in transcribing, printing, or translating, or to the fact that preliminary and final figures have both gotten out into public channels, or to the revision by the SSB of figures previously released without adjustment.

What, then, can properly be considered "official" data? For present purposes, the term will be applied to all figures issued by the SSB, to data cited by recognized government officials, to figures used by scholars in demographic research and training centers, and to data released through other channels that are consistent with official data, are clearly identified and dated, and are confirmed by other Chinese sources. In view of the fact that public citation of national data requires prior authorization by the State Council, it is probably safe to assume that most, if not all, of these figures originated in the official data series compiled by the SSB and approved for release by the State Council.

POPULATION TOTALS AND VITAL RATES

Table 1 gives all of the national population totals and vital rates for China for the years 1949–80 that have been released to date, except for a few figures for the early and middle 1950's that were superseded by data issued later by the SSB. Among the population totals, those issued during the past three years are the series for 1965–80 and the revised figures for 1954 and 1956. Recent sources have also reaffirmed the totals for 1949–53, and 1957. The 1964 census total has now been cited in two magnitudes that differ by about 3.4 million, a discrepancy that has not been explained. Among the vital rates, those for 1952 and 1954–57 were available in more rounded form in the late 1950's, but the 4-digit versions of these figures and the other vital rates in the table have all been released for the first time since 1978.

TABLE 1.—POPULATION TOTALS AND VITAL RATES

[Absolute figures in thousands; vital rates per 1,000 population per year]

Year	Annual average population	Census figures	Yearend population	Crude birth rates	Crude death rates	Natural increase rates	Net increase rates
1949	536, 360		541, 670	36	20	16	
1950	546, 820		551, 960	37.0	18.0	19.0	(18.82)
1951	557, 480		563, 000	37	17	20	(19.80)
1952	568, 910		574, 820	37.00	17.00	20.00	(20.78)
1953	581, 390	582, 603	587, 960	37.0	14.0	23.0	(22.60)
1954	(595, 310)		602, 660	37.97	13.18	24.79	(24.69)
1955	(608, 655)		614, 650	32.60	12.28	20.32	(19.70)
1956	(621, 465)		628, 280	31.90	11.40	20.50	(21.93)
1957	(637, 405)		646, 530	34.03	10.80	23.23	(28.63)
1958							
1959				24.78	(14.59)	10.19	
1960					25.4		
1961							
1962				37	10	27	
1963		{691, 220}		43.6	10.1	33.5	
1964		{694, 582}		39.3	11.5	27.8	
1965			725, 380	38.06	9.55	28.51	
1966	(733, 720)		742, 060	35.2	8.9	26.3	(22.75)
1967	(751, 190)		760, 320	34.1	8.4	25.7	(24.31)
1968	(771, 120)		781, 920	35.8	8.3	27.5	(28.09)
1969	(792, 665)		803, 350	34.3	8.1	26.2	(26.96)
1970	(814, 385)		825, 420	33.59	7.64	25.95	(27.10)
1971	(836, 605)		847, 790	30.74	7.34	23.40	(26.74)
1972	(857, 530)		867, 270	29.92	7.65	22, 27	(22.72)
1973	(877, 440)		887, 610	28.07	7.08	20.99	(23.18)
1974	(895, 850)		904, 090	24.95	7.38	17.56	(18.40)
1975	(911, 895)		919, 700	23.13	7.36	15.77	(17.12)
1976	(926, 185)		932, 670	20.01	7.29	12.72	(14.00)
1977	(938, 955)		945, 240	19.03	6.91	12.12	(13.39)
1978	(951, 665)		958, 090	18.34	6.29	12.05	(13.50)
1979	(964, 505)		970, 920	17.90	6.24	11.66	(13.30)
1980	(976, 735)		982, 550				(11.91)

Note: Figures in parentheses are derived rather than reported figures.

The most conspicuous problem with the series is that the natural increase rates are too low to fit with the population totals without a substantial net immigration into the country for all years except 1950 and 1954. In table 1 the column at the extreme right gives the equivalent rates calculated from the population totals (net increase during the year divided by the annual average population for the year), which in the 1970's were from 0.5 to 3.3 per thousand higher than the official natural increase rates. This discrepancy is puzzling because ostensibly the vital rates and the national population totals should both be obtainable from the local population registers. However, when it was pointed out to an official of the SSB in November in 1979, he explained that the vital rates for the country as a whole were not based on complete reporting of births and deaths but were estimates prepared by the SSB from incomplete data. How the estimates were prepared and why they were not adjusted to eliminate the discrepancy was not explained. But as Judith Banister has pointed out, the official natural increase rate for 1978 is not significantly different from that which could be calculated by taking a population-weighted average of the provincial natural increase rates for 1978.[4]

Two other Chinese sources give figures on natural increase that also conflict with the official population totals. Zhu Zhengzhi, of Beijing University, provides absolute totals of births, deaths, and natural increase for four periods: 1950–57, 1958–61, 1962–71, and 1972–79. He notes that the net population growth during these years was 429.25 million—exactly the difference between the official population totals for yearend 1949 and yearend 1979.[5] But the sum of his absolute natural increase figures for the four periods is 434.69 million. To fit these natural increase figures with the official population totals requires the assumption of a net out-migration from China of 5.44 million people, yet the author says nothing about migration and, in fact, does not even allude to the difference. The idea that it might be accounted for by emigration cannot be sustained when the period differences between population growth and natural increase are compared. During the first period, the figures imply a net in-migration of 4.09 million. The official population totals for yearend 1971 and 1979 imply another net in-migration of 8.03 million. This means that during the middle two periods there would have been a net out-migration of 17.56 million persons, which is simply not believable. Obviously, the inconsistencies in the figures given in this article are due not to demographic events but to statistical problems.

An article in the October 1980 issue of China's new demographic journal, Population Research, gives a net increase figure of 437.27 million for the same 30-year period, 7.92 million larger than the net increase shown by the official population totals. But the author of this article derived his increase figure by summing the differences between the 1949 and 1979 totals for what he calls the "urban population" and the "agricultural population."[6] When his urban and agricultural figures for these two years are added together to get the corresponding total population figures, they sum to only 504.91 million for 1949 and 942.18 million for 1979, some 37 and 29 million, respectively, below the official population totals. One might hypothesize that the author had mistaken "agricultural" for "rural" population and that the differences in both cases represented the nonagricultural population residing in rural areas, but in that case the residual should be much larger in 1979 than in 1949 because of the development of commune industry since 1958. Evidently this is not the explanation.

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[4] Judith Banister, "What Is China's True Fertility Level?" paper presented at the annual meeting of the Population Association of America, Washington, D.C., Mar. 27, 1981, p. 5.

[5] Zhu Zhengzhi, "Dangqian woguo renkou wenti ji qi fazhan qushi" ("China's Population Problem at the Present and Its Trend of Development"), Jingji kexue (Economic Science), No. 3, 1980, pp. 54–58.

[6] Zhu Zhuo, "Shi lun woguo renkou heli fenbu wenti" ("On the Rational Distribution of China's Population"), Renkou, yanjiu (Population Research), No. 3, October 1980, pp. 11–17.

In both these articles, the authors seem to be under the impression that their figures are compatible with official data. Perhaps they did not have access to enough of the official data to be able to detect the discrepancies or were not at liberty to seek clarification before their articles were published. In any case, the anomalies apparent in their figures do not necessarily point to anomalies in the official data.

The most serious problem with the official population totals is the fact that the 1964 census total is too low to be assimilated easily into a series with the official totals for the 1950's. For many years, foreign analysts thought that the 1964 total was about 30 million below the level of previous figures. Some assumed that the publication of the 1964 total meant that the Chinese statistical authorities had abandoned the previous figures, including the 1953 census total. Taking the 1964 total as a base, they scaled down their estimates for earlier years in order to show what they felt was a more plausible rate of population growth between 1957 and 1964. The low projections also seemed to make it possible to stay closer to the round totals of 700 and 800 million appearing in Chinese news dispatches during the late 1960's and the early 1970's.

Other analysts rejected the 1964 total on the assumption that the 1964 census had been hasty and superficial and had relied too much on registration records that were incomplete because of disruptions during the Leap Forward and the food crisis. Both groups discounted the possibility of a large scale depopulation during the food crisis. Foreign observers were well aware from refugee reports and from captured Chinese army political documents that malnutrition was widespread in China during 1960 and 1961 and that mortality had risen, particularly among older people, and some assumed from the reports of amenorrhea among Chinese women that fertility must also have declined. But most observers felt that if mass starvation had been going on, evidence would have reached the outside world despite Chinese efforts at concealment. The most pessimistic of foreign observers surmised that natural increase might have fallen to zero at the pit of the crisis.

Not until 1979 did Chinese sources reveal that the official data indicated a much more severe catastrophe. They had already made it clear that the SSB was still standing by the yearend 1957 total of 646.53 million. In July 1979, members of the SSB's census planning delegation said that the 1964 census was even more accurate than the 1953 and confirmed foreign suspicions that the provincial totals given in a 1972 Chinese atlas were the results of the 1964 census. Thus there was no escaping the conclusion that the SSB's series of official data included both the 1950's figures and the 1964 census total. Somewhere in the years between 1957 and 1964, a major population loss was necessary if these figures were to be fitted into a single series.

The size of the loss required was increased by the disclosure in a Shanghai newspaper article in July 1979 that natural increase had reached 33.5 per thousand in 1963, an all-time peak for China.[7] The high increase rate for 1963 meant that backwards projection from the 1964 total would produce still lower figures for the crisis years, unless low increase rates were assumed for 1958–59, 1962, and 1964. Then in

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[7] Wang Jianmin, "Qieshi kongzhi renkou zengzhang" ("Earnestly Control the Growth of Population"), Wenhui bao, Shanghai, July 12, 1979, p. 3.

October 1980 in a paper for a population conference held in Beijing, Liu Zheng, Director of the Population Research Institute of Chinese People's University, provided vital rates for 1962 and 1965 which included a natural increase rate of 27 per thousand in 1962 and 28.51 in 1965, implying a rate for 1964 that was somewhere in the high 20's at the very least.[8] Even allowing for declining growth rates in 1958 and 1959, the estimated yearend total for 1961 would have to be some 18 to 20 million below the estimated yearend 1959 figure!

As this picture began to take shape, at least some foreign analysts reacted with disbelief. They speculated that perhaps the Chinese statistical authorities were placing too much confidence in a 1964 census total that was defective and that a part of the apparent loss of population during the crisis was due instead to large omissions from the 1964 count. However, other information and data from China tended to support the view that the crisis had had a major demographic impact. Several sources reviewing China's economic history since 1949 indicated that the national economy had been on the brink of collapse not only during the Cultural Revolution but also in the aftermath of the Leap Forward.[9] Another source revealed that food grain production in 1960 was 26.4 percent below that for 1957.[10] Recently published notes made in October 1959 by the Defense Minister Peng Dehuai, who had criticized the Leap Forward at the Lushan Party conference of July–August 1959 and had been dismissed in disgrace as a result, say that the mass labor projects ordered by the Party Central Committee during the last four months of 1958 had prevented the peasants from harvesting crops with the result that people were "left with nothing to eat in the first half of 1959."[11] In February 1981 it was disclosed that the national death rate had risen to 25.4 per thousand in 1960.[12]

The effects of the crisis years on fertility are indicated in a series of absolute birth totals plotted on a graph in an April 1980 article in a Chinese magazine for foreign readers. The actual figures are not given, but they can be read from the graph to within about ±100,000.[13] When the series of absolute birth totals from the graph are compared with the period birth totals given by Zhu Zhengzhi, the graph figures are, on the average, about a half million too low, but the series can be adjusted using Zhu's period totals as controls on the assumption that both were derived from a common source. The adjusted series is given in table 2. From the table it can be seen that in absolute terms fertility had already begun to decline in 1958 and 1959 but dropped precipitously in 1960 and reached a low point of less than 12 million births in 1961. The birth totals for 1960 and 1961 would mean crude birth rates of about 20 and 18 per thousand, respectively, during these two years, which would imply a negative natural increase rate of about 5 per thousand for 1960 and quite probably a negative rate for 1961 as well. According to Zhu Zhengzhi, the natural increase rate was in fact negative for several years during the period 1958–61.[14]

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[8] Liu Zheng, "The Present Situation and the Development of China's Population," Beijing International Round Table Conference on Demography, October 1980, p. 3.

[9] For example, see Li Chengrui and Zhang Zhouyuan, "Only Proportionate Development Can Ensure High Speed," Beijing Review, No. 19, May 11, 1979, p. 15.

[10] Zhang Qingwu, "Kongzhi chengshi renkou de zengzhang" ("Control the Growth of the Urban Population"), Renmin Ribao (People's Daily), Beijing (*RMRB*), Aug. 21, 1979, p. 3.

[11] "Peng Dehuai Notes on Lushan Plenum Published," Jindai shi yanjiu (Study of Modern History), Beijing, No. 4, 1980, Joint Publications Research Service (JPRS), No. 77668, Mar. 25, 1981, p. 8.

[12] Sun Yefang, "Consolidate Statistics Work: Reform the Statistical System," Jingji guanli (Economic Management), Feb. 15, 1981, FBIS, No. 58, Mar. 26, 1981, L5.

[13] Wang Naizong, "Solving China's Population Problem," China Reconstructs, vol. XXIX, Apr. 1980, p. 5.

TABLE 2.—ADJUSTED BIRTH TOTALS SERIES AND ZHU ZHENGZHI'S COMPONENTS OF CHANGE TOTALS

[In thousands]

Year	Adjusted birth totals	Zhu Zhengzhi's figures			
		Period	Births	Deaths	Natural increase
1950	20, 012	1950–57	167, 080	66, 280	100, 770
1951	20, 217				
1952	20, 319				
1953	20, 525				
1954	22, 577				
1955	20, 627				
1956	21, 140				
1957	21, 663				
1958	19, 052	1958–61	61, 290	43, 830	17, 450
1959	17, 149				
1960	13, 338				
1961	11, 751				
1962	24, 354	1962–71	267, 620	66, 250	201, 370
1963	29, 537				
1964	27, 487				
1965	28, 093				
1966	25, 364				
1967	25, 263				
1968	27, 487				
1969	27, 285				
1970	27, 588				
1971	25, 162				
1972	25, 260	1972–79	164, 720	51, 240	115, 100
1973	24, 753				
1974	23, 840				
1975	21, 304				
1976	18, 463				
1977	16, 435				
1978					
1979					

Note: There are discrepancies between Zhu's birth and death totals and his natural increase totals in 3 of the 4 cases and in 2 of these the differences are too large to be accounted for by rounding.

Source: See text.

Although the birth totals may have been derived from official data on fertility, they cannot be combined with the official population totals for 1957 and 1964 without assuming death rates during the crisis years much higher than the official crude death rate for 1960. Even if natural increase is allowed to drop as low as 17 per thousand in 1958 and 9 per thousand in 1959, the negative natural increase rate of around 5 per thousand in 1960 must be followed by a negative rate of at least 25 to 30 per thousand in 1961 in order to reach the 1964 census total. This means a net loss of between 20 and 25 million persons during 1960 and 1961. Natural increase for the period 1958–61 is less than 6 million and mortality between 62 and 67 million instead of the 17 million and 44 million, respectively, calculated by Zhu Zhengzhi. The birth totals are simply not compatible with the national population totals if the 1964 census figure is included among them.

Another series of figures with which the birth totals can be compared is a set of index values for the size of the female cohorts reaching marriage age between 1980 and 2000. The latter figures are provided by Liu Zheng in his paper of October 1980 cited earlier.[15] It is apparent from Liu's figures that he assumed that all the girls of a given cohort would reach marriage age at exactly age 22, which is two years older than the minimum age for marriage established by the new marriage law as of January 1, 1981, but a year earlier than the minimum age widely enforced in rural areas in China before this limit was invalidated by the new marriage law. What allowance Liu made for attrition due to mortality is not known. He may not have made any, which would be equivalent to an assumption of constant mortality for females from 1958 through 1978. In any case, Liu's index values can be plotted against index values computed from the adjusted birth totals for 1958–77 lagged by 22 years.[10] The results of this matching are shown in figure 1.

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[14] Zhu Zhengzhi, loc. cit.

[15] Liu Zheng, op. cit., p. 10.

It is obvious at a glance that the two plots show a generally similar but not identical pattern. Liu's series implies that the lowest birth rate in the food crisis period occurred in 1960, whereas the birth series puts it in 1961. Both series assign the birth peak to 1963, but they diverge between 1964 and 1965. From 1965 through 1971, the two series are closely correlated, but after 1971 they differ considerably. It seems unlikely, therefore, that the two sets of data come from the same source.

One further comparison is possible, although it is incomplete, and that is between the officially reported birth rates and those which can be obtained by dividing the birth totals by the official or estimated annual average figures for the years for which official birth rates are available. The figures are shown in table 3. The comparison can be made for 26 of the 28 years for which birth totals are available. In 16 cases the difference between the official birth rate and that derived from the birth totals is less than 1 per thousand, and the largest difference among the remaining 10 cases is just over 2 per thousand (for 1956), even though the birth totals are only approximate and the annual average population totals used in some years are estimated. In general, therefore, the correspondence seems to be rather close. This does not, however, establish beyond doubt that the birth series and the official vital rates have a common origin. The discrepancies in 1974 and 1977 are too large to be accounted for by errors in estimating.

TABLE 3.—OFFICIAL CRUDE BIRTH RATES AND BIRTH RATES ESTIMATED FROM THE ADJUSTED BIRTH TOTALS SERIES

[Per thousand population]

Year	Official CBR	Birth totals CBR	Year	Official CBR	Birth totals CBR
1950	37	36.60	1965	38.06	39.43
1951	37	36.26	1966	35.2	34.57
1952	37	35.72	1967	34.1	33.63
1953	37	35.30	1968	35.8	35.64
1954	37.97	37.92	1969	34.3	34.42
1955	32.60	33.89	1970	33.59	33.88
1956	31.90	34.02	1971	30.74	30.08
1957	34.03	33.99	1972	29.92	29.46
1958			1973	28.07	28.21
1959	24.78	25.94	1974	24.95	26.61
1962	37	37.44	1975	23.13	23.36
1963	43.6	44.85	1976	20.01	19.93
1964	39.3	39.77	1977	19.03	17.50

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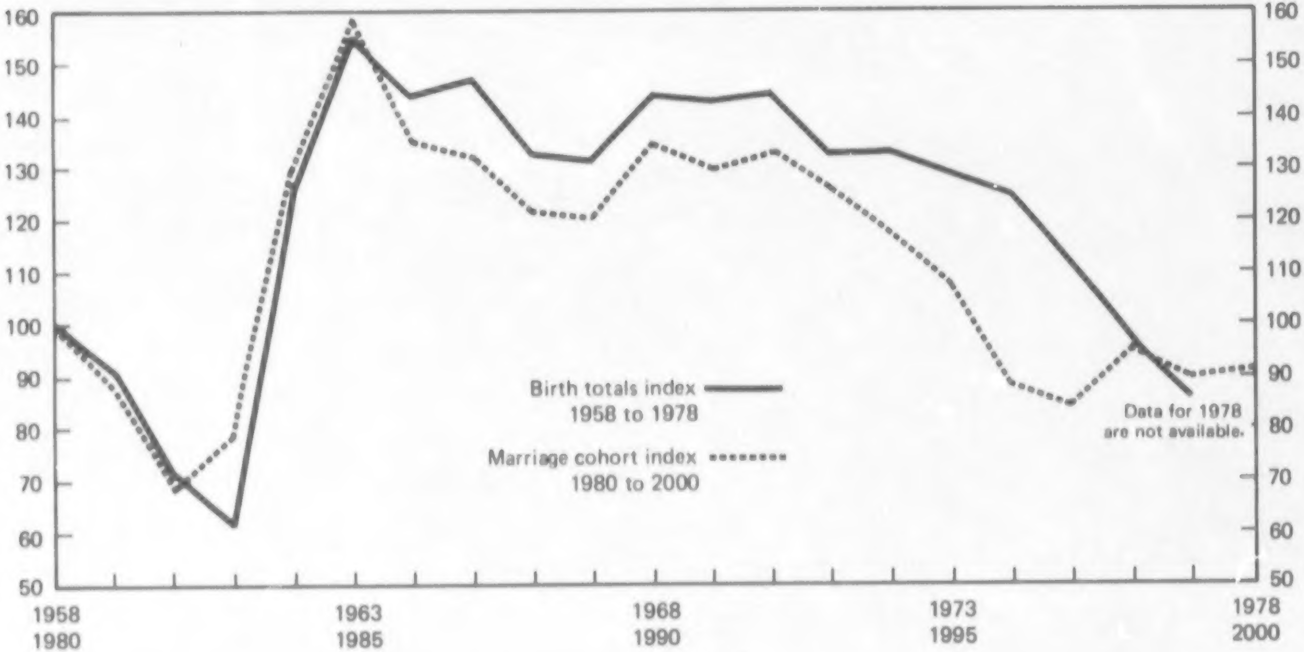
[10] This comparison was suggested by Prof. Ansley Coale, of the Office of Population Research, Princeton University.

FIGURE 1.

Comparison of Liu Zheng's Female Marriage Cohort Index with an Index Based on the Birth Totals Series



The plausibility of the official vital rates themselves is open to some question. Some observers have long believed that the level of the official birth and death rates for the 1950's is too low. It has been argued that the birth rate during those years should have been at least as high as the low 40's per thousand and that the death rate could not have fallen much below 20 even by 1957, presumably the low point for the decade. The sudden and extreme rebound in the birth rate shown in the official series for 1962 and 1963 and the equally sudden drop in the death rate to 10 per thousand are also curious and improbable developments. Despite recollections of individual Chinese informants that among their acquaintances almost every fertile woman became pregnant immediately after the food crisis, the peak of 43.6 per thousand seems high relative to the rates of the 1950's. Also the rebound in 1962 comes at least a year too soon. Presumably 1961 was, like 1962, a year of serious crop failures, in which case food shortages should have persisted well into the middle of 1962 even if weather conditions had again turned favorable and the misguided management tactics of the Leap Forward had been abandoned. The situation could not have improved much in most of the country until the first substantial crops of 1962 had been harvested. To the extent that malnutrition and starvation had caused the rise in mortality, it should have begun to decline by about the middle of the year, but this would hardly have sufficed to reduce the death rate for the whole year below the 1957 level. The rise in the birth rate should not have set in until at least 9 months after the symptoms of acute malnutrition had disappeared, which means that the rebound could not have begun before the second quarter of 1963. Yet the official birth rate for 1962 is higher than that for 1957. One possible explanation of these anomalies is that death registration continued to be incomplete, as it had been before and during the food crisis, and that many births that went unregistered during the crisis years because of a general lapse of recordkeeping were being registered belatedly in 1962 and 1963. In the absence of corroborating evidence, of course, such explanations are mere speculation.

The precipitous drop in fertility represented by the official birth rates for 1970–76 is another anomaly that is not easily explained. The third birth control campaign was, from all indications, just getting under way in 1970 and did not become intense until late 1972 or early 1973. Hence the official birth rate, which was in the middle 30's per thousand from 1966 through 1970 would not have been expected to begin a rapid decline before 1974, but the reported data show it falling sharply between 1970 and 1971, very slowly in 1972 and 1973, and then very sharply for the next three years. The last year of rapid decline, 1975–76, coincided with the final year of the "gang of four," who were subsequently accused of having disrupted and "sabotaged" birth control work.[17] If the charge is valid, it does not seem to be supported by the data, since the decline in the official birth rate was most rapid during the last years of the "gang" and slowed considerably after their deposition. But it is possible also that the decline in the birth rate during the early to middle 1970's owed more to the falsification of data than to success in family planning, since the "gang" allegedly took a cavalier attitude toward statistics. More will be said about this hereafter.

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[17] For example, see Guangzhou radio, Dec. 12, 1976, FBIS, No. 242, Dec. 15, 1976, p. H16; Chengdu radio, Dec. 21, 1976, FBIS, No. 248, Dec. 26, 1976, p. J2; Kunming radio, Jan. 21, 1977, FBIS, No. 17, Jan. 26, 1977, p. J3; and "Under the Guidance of Chairman Mao's Brilliant Thoughts, Great Achievements Were Accomplished in National Birth Control," Xinhua, Beijing, Feb. 21, 1977, Zhongguo xinwen (China News), Hong Kong, Feb. 22, 1977, JPRS, No. 69,791, Sept. 14, 1977, p. 42.

The discovery of persistent anomalies in the official population totals and vital rates from China inevitably raises questions as to how the figures were obtained. So far as the early 1950's are concerned, the figures have to be estimates. There was no national system of population registration until after the 1953 census, and even then it took several years to establish and was still incomplete in 1956.[18] The vital rates for all years prior to 1956 were presumably based on sample vital registration work carried on in a few areas of China in the early 1950's, which were in some unspecified manner extrapolated to the rest of China and extended backward to 1950 and forward to the point where the national registration system began to function. The Leap Forward of 1958 must have thrown the population registers into disarray, as it did all other kinds of statistical work. If the peasants did not have time to harvest their crops, they would certainly not have had time to report births, deaths, and migration to the proper authorities. Once serious food shortages had begun in the spring of 1959, helping the authorities keep records would not have been their first concern. The restoration of population registration and of statistical work in general which followed the recovery from the food crisis could not have gotten very far before the country was plunged into the utter confusion of the Cultural Revolution, during which government officials at all levels, including statisticians, were subjected to political harassment and physical abuse by the Red Guard and Revolutionary Rebel detachments any many public records were destroyed.

It is difficult to believe that the population registers came through all three disasters unscathed or that it would be possible to obtain a reasonably accurate set of vital rates from whatever records survived the turmoil and destruction. What happened after the Cultural Revolution is also obscure. Statistical work was not immediately revived. The SSB, which virtually ceased to exist during the Cultural Revolution, was not formally re-establishd until 1974, and it is still operating with only half the staff it had in 1965. Hence the statistical basis for the population totals and vital rates of the first half of the 1970's is also in doubt.

It seems likely that the vital rates for all years from 1957 until the late 1970's and all of the population totals for the same years except for 1964 had to be estimated retrospectively in some fashion from incomplete data, or in some years, no data at all, or that they were derived by reconstruction from more recent data. This may explain why neither the figures nor the trends were mentioned in national or local news dispatches in prior years, even in connection with family planning work. The most likely hypothesis is that recent age data for China were used to estimate births, deaths, and natural increase in the past and to project specific age cohorts in the future. Controlling to official population totals in retrospective reconstructions would be difficult, which could explain the inconsistencies between Zhu Zhengzhi's period totals for natural increase and the official population totals for the earlier years.

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[18] For further discussion, see John S. Aird, "Official Population Data," chapter 5 in Yuan-li Wu, ed., China : A Handbook, Praeger Publishers, New York, 1973, pp. 94–96.

Liu Zheng says that his female marriage cohort index values were based on the "young-aged composition of our population,"[19] which means that a recent age distribution by sex was used. Since the most recent available, so far as is known, is one obtained by a special survey in 1978, which is discussed below,[20] and since he was trying to project the size of female marriage cohorts to the year 2000, this may explain why he chose age 22 as the assumed female marriage age for all cohorts. Presumably the same distribution was used in reconstructing the absolute birth totals series, but if so, the distribution was modified for much of the 1970's, perhaps because it was in conflict with the birth rates derived from the provincial reports. Also, the birth series ends in an extremely low figure for 1977, only about 16.4 million, whereas the independently reported birth total for 1978 was 17.4 million,[21] a figure that is much more consistent with the official birth rate. The similarities between the Liu series, the birth totals series, and the official vital rates may be due to the use of a common set of age data and the discrepancies to substitution of other source data for individual years or parts of a series for various reasons. Until authoritative Chinese sources reveal how the figures were obtained and provide enough statistical details to permit a more careful analysis, the explanation of their inconsistencies and in fact their overall reliability must remain in doubt.

AGE AND SEX COMPOSITION

Prior to 1979, the only data on age composition in China available to foreign analysts were from the 1953 census. In a paper for the December 1956 meetings of the Indian Statistical Institute of Calcutta, Prof. Dai Shiguang provided sex ratios for irregular age groups that showed an average of over 115 males per 100 females at ages 7 to 13 years and dropped down to 87 for ages 56 and over.[22] Dai also provided figures on the percentage of the population at ages 0 to 14, 15 to 49, and 50 and over, but these figures were said to be estimates, and they differed somewhat from the corresponding data obtained later from other sources. Prof. Chen Da submitted a paper for the August 1957 meetings of the International Statistical Institute in Stockholm but, unlike Dai, was not able to attend the meetings. His paper included a series of percentage figures for both sexes in 10-year age groups, the first complete series of age data from the 1953 census to be made public.[23] In May 1959, the writer of an article in a health journal, Tian Fengtiao, gave another 1953 census percentage age distribution in 10-year ago groups that were offset by 5 years from Chen Da's figures, and he also provided an age-sex pyramid plotted from percentage figures for 5-year age groups by sex, from which the census age distribution could be reconstructed using the two sets of 10-year age group percentages and Dai's sex ratios as controls.[24]

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[19] Liu Zheng, loc. cit.

[20] See p. 188.

[21] Chen Muhua, "Shixian sige xiandaihua, bixu you jihuade kengzhi renkou zengzhang" ("For the Realization of the Four Modernizations, There Must Be Planned Control of Population Growth"), RMRB, Aug. 11, 1979, p. 2.

[22] Dai Shiguang, "1953 Population Census of China," Indian Statistical Institute, Calcutta, Dec. 20, 1956, p. 21.

[23] Chen Da, "New China's Population Census of 1953 and Its Relations to National Economic Reconstruction and Demographic Research," International Statistical Institute, Stockholm, Aug. 8–15, 1957, p. 23.

For the next 20 years projections of China's population made by foreign analysts began either with the 1953 census age-sex data or with model data. In November 1974, an article in a medical journal mentioned that the 1964 census age distribution was used to compute standardized incidence rates for oesophageal cancer but did not give the figures.[25] Then toward the end of 1978, a British doctor visiting China obtained percentage distributions by 5-year age groups for males, females, and both sexes from the 1964 census and included them in his trip report.[26] In the spring of 1980, an American doctor obtained an age distribution by 5-year age groups for both sexes in thousands which was reportedly based on a 10 percent sample of the areas included in a national cancer incidence survey conducted by the Cancer Institute of the Chinese Academy of Medical Sciences in the middle 1970's. The population data seem to refer approximately to the middle of 1976 on the average and add to a total of 842 million, about 91 percent of the official total at that time.[27] Other sources have cited data for large age groups from a subsequent survey that apparently refers to 1978.[28] Suddenly, in the last two years, it has become possible to compare age composition at several points in the past three decades with what would be expected on the basis of the trend in the official vital rates. The four sets of age data are given in table 4.

TABLE 4.—PERCENTAGE AGE DISTRIBUTIONS: 1953 CENSUS, 1964 CENSUS, 1976 SURVEY, AND 1978 SURVEY

Age group (years)	1953 census			1964 census			1976 survey, both sexes	Age group (years)	1978 survey, both sexes
	Both sexes	Males	Females	Both sexes	Males	Females			
All ages	99.99	100.01	100.03	100.00	100.0	100.0	100.01		100.0
0 to 4	15.59	15.53	15.65	14.52	14.5	14.5	12.41		
5 to 9	10.94	11.23	10.63	13.65	13.9	13.4	13.52	0–14	38.6
10 to 14	9.39	9.71	9.04	12.52	12.7	12.3	12.35		
15 to 19	9.10	9.28	8.91	9.01	9.2	8.9	9.32		
20 to 24	8.24	8.27	8.21	7.37	7.5	7.3	9.15	15–29	24.8
25 to 29	7.76	7.96	7.55	7.31	7.6	7.0	7.50		
30 to 34	6.88	7.03	6.72	6.77	7.0	6.6	5.95		
35 to 39	6.41	6.47	6.35	5.97	6.1	5.8	5.54		
40 to 44	5.56	5.55	5.57	5.17	5.2	5.1	5.11	30–64	31.8
45 to 49	5.01	4.97	5.07	4.47	4.4	4.5	4.56		
50 to 54	4.24	4.20	4.30	3.84	3.8	3.9	3.91		
55 to 59	3.61	3.53	3.70	3.27	3.0	3.5	3.28		
60 to 64	2.90	2.73	3.08	2.56	2.3	2.9	2.77		
65 to 69	2.03	1.79	2.29	1.69	1.4	1.9	2.01		
70 to 74	1.37	1.09	1.68	1.07	.8	1.3	1.39	65+	4.8
75 to 79	.61	.46	.78	.55	.4	.7	.77		
80 plus	.35	.21	.50	.26	.2	.4	.47		

Source: See text.

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[24] "Tian Fengtiao." Woguo jihua shengyu he renkou zengshi wenti" ("The Problem of Planned Births and Population Increase in China"), Renmin baojian (People's Health), vol. 1, No. 5, May 1959, p. 463.

[25] Coordinating Group for Research on the Etiology of Oesophageal Cancer in North China, "Huabei dichu shiguanyan liuxingbingxue he bingyinxue de chubu diaocha yanjiu" ("Epidemiology and Etiology of Oesophageal Cancer in North China: A Preliminary Report"), Zhonghua yixue zazhi (Chinese Medical Journal), No. 11, November 1974, p. 671.

[26] C. S. Muir, "Duty Travel to China: November-December, 1978," January 1979, Annex I.

[27] Frederick P. Li, "Cancer Incidence in China, 1975–2000: Implications for Cancer Control," Clinical Epidemiology Branch, National Cancer Institute, Bethesda, Maryland, and Sidney Farber Cancer Institute, Boston, Massachusetts, no date, table 1.

[28] Yu Zhenping, Xinhua, Beijing, Feb. 13, 1980, FBIS, No. 33, Feb. 15, 1980, pp. L12–13; and Zhang Lequn, "Weishenma yao tichang yidui fufu zhi sheng yige haizi?" ("Why Must One Child per Couple Be Promoted?"), RMRB, Apr. 15, 1980, p. 5.

At a glance, there are three aspects of these age data that seem a little strange. First, the 1964 age distribution shows lower proportions at ages 40 and over than does the 1953 distribution, a change that would be understandable only if there had been an awesome decimation of the elderly in the interim. Second, the 1964 proportion at ages 0 to 4 is surprisingly high for an age group that includes cohorts from several years of very low fertility and presumably high infant mortality. Third, the 1976 distribution shows a sharp drop between ages 10 to 14 and ages 15 to 19, due apparently to the fact that the latter group includes the deficit cohorts of the food crisis years, yet the age group that contains the same cohorts in 1964 does not seem to have been as much affected by them. Evidently the 1953, 1964, and 1976 age distributions are not entirely compatible.

Precise comparisons cannot be made without single year of age data, which are not available. Such data reportedly exist for the two censuses and are in use by Chinese demographers, but for the 1976 survey the age data were reported from the field only in 5-year age groups. Since there is a difference of 11 years between the censuses and 12½ years between the second census and the cancer survey, it is not possible to match corresponding 5-year age groups in the three distributions. The 1978 survey results have not been made public even in 5-year age groups, hence there is very little that can be done with the 1978 data for the time being.

Another way of testing the plausibility of the four age distributions is to compare them with models based on the 1953 census age-sex distribution, the official population totals, and the official vital rates for the years for which official data are missing. This exercise was carried out by the author and reported in a paper presented to an international conference on the population of China, the first of its kind ever convened, which was organized by the East-West Centers' Population Institute, and met in Honolulu May 17–21, 1980.[29] In this paper three models were presented, each based on a different method rationalizing the inconsistencies between the official totals and the vital rates. All models incorporated the official totals available at the time they were constructed, but estimated totals had to be substituted for missing data at many points. In general, these proved to be quite close to the corresponding official figures subsequently released. The latter figures would not have significantly affected the age distributions generated by the models.

The initial age distribution in all three cases was a reconstructed 1953 census age-sex distribution in single years of age based on the distribution by 5-year age groups given in table 4. Model A began with the reported total for the 1953 census and the increase rates for the middle 1950's that are implicit in the official population totals for 1953–57, with an adjustment of the 1956 figure to avoid the impossibly high growth rate implied by the official totals for yearend 1956 and 1957. Birth rates for the 1950's were derived as the sum of the natural increase rates and the officially reported death rates. The vital rates assumed for 1957–61 were designed to permit the attainment by the start of 1962 of a population total derived from the 1964 census total and an assumed increase rate of 30 per thousand for 1964, the official rate of 33.5 for 1963, and an assumed rate of 10 for 1962, for which no official rate was then available. The national increase rates assumed for 1958 and 1959, though falling from the 1957 level, were still fairly high, with the result that the net loss of population in 1960 and 1961 was close to 25 million. Most of the loss was assigned to 1961 on the presumption that the combined effects of lower fertility and higher mortality would have been greater in that year. For later years, population totals and vital rates were interpolated between the available official figures in accordance with the trend indicated by those figures. The yearend 1969 population total turned out to be about 2 to 3 million higher and the natural increase rates for the early 1970's slightly higher than the official figures subsequently released, but these are minor differences.

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[29] John S. Aird, "Reconstruction of an Official Data Model of the Population of China," May 15, 1980.

In Model B, the absolute birth totals, which had just been received as the model was being prepared, were incorporated, and mortality was set at whatever level was required to accommodate to the official population totals and the totals derived by interpolation between the official figures. The population totals and vital rates in Model B came somewhat closer than those in Model A to the official figures for 1969 and the latter half of the 1970's subsequently obtained from Chinese sources. The main difference between the two models was that the use of the absolute birth totals in Model B resulted in a much more rapid decline in natural increase in 1958 and 1959 and a much higher natural increase rate in 1962. The net population loss in 1960–61 increased to almost 28 million in Model B.

Model C made use of the official vital rates for 1953–57 inflated by 4 percent so that, starting with the census total in 1953, the series reached the official population total for yearend 1957. Model C assumed that the official vital rates in the 1960's were displaced backward by one year because the Chinese age reporting in the age distribution used to reconstruct the series. Hence the 1963 increase rate of 33.5 per thousand was reassigned to 1964, a low rate of 7 per thousand was chosen for 1962 on the assumption that fertility in that year was still depressed by the food shortages of 1961 and the first half of 1962, and the natural increase rates for 1958 and 1959 were set somewhat higher as in Model A. These assumptions reduced the net population loss in 1960–61 to less than 16 million. In the 1970's, the death rates were raised once again to the level of the official figures, and the birth rates were derived as the sum of the death rates and the natural increase rates implied by the official and derived population totals. By the time this model was constructed, the official figures for 1969 and 1975–79 were available.

Comparing the midyear 1964 age distributions generated by these models with the 1964 census age distribution tests the consistency of the 1964 census age distribution with that from the 1953 census and with the intercensal vital rates. The percentage figures for both sexes for the two censuses and for the three models for 1964 are given in table 5. It is obvious at once that all three models have much smaller proportions of the total at ages 0 to 4, the age group which includes the birth cohorts of the crisis years. Even Model B, which incorporates the absolute birth figures, has some 2.5 percent less of the population in this age group, a difference of almost 18 million persons. Age group 5 to 9 is also smaller in the models, and especially in Model B, than in the census age distribution. The 1964 census age distribution evidently did not come from a population whose vital rates followed the trend of the official vital rates or the official birth totals between year-end 1957 and midyear 1964. If the census age distribution is correct, the crisis population loss in 1960–61 could not have been as severe as would have been required to keep the population total as low as the 691.22 million reported for midyear 1964. If the crisis was severe enough to hold the population down to the 1964 census total, the proportion of the population at ages 0 to 4 could not possibly have been as high as 14.52 percent in 1964. In short, the 1964 census total is incompatible with the 1964 census age distribution.

TABLE 5.—PERCENTAGE AGE DISTRIBUTIONS IN 5-YR AGE GROUPS, 1953 CENSUS, 1964 CENSUS, AND MODELS A, B, AND C AS OF MIDYEAR 1964

Ages (years)	1953 census	1964 census	Model A	Model B	Model C
All ages	99.99	100.00	100.00	99.99	100.00
0 to 4	15.59	14.52	11.91	11.95	11.08
5 to 9	10.94	13.65	12.93	12.24	12.98
10 to 14	9.39	12.52	12.78	12.74	12.98
15 to 19	9.10	9.01	9.80	9.85	9.83
20 to 24	8.24	7.37	7.55	7.59	7.58
25 to 29	7.76	7.31	7.15	7.21	7.19
30 to 34	6.88	6.77	6.55	6.60	6.58
35 to 39	6.41	5.97	5.99	6.05	6.04
40 to 44	5.56	5.17	5.35	5.41	5.39
45 to 49	5.01	4.47	4.80	4.86	4.85
50 to 54	4.24	3.84	4.16	4.21	4.20
55 to 59	3.61	3.27	3.50	3.55	3.55
60 to 64	2.90	2.56	2.81	2.86	2.86
65 to 69	2.03	1.69	2.10	2.15	2.15
70 to 74	1.37	1.07	1.44	1.48	1.49
75 and over	.96	.81	1.18	1.24	1.25

Sources: See text.

Other differences between the census and model age distributions are less startling but also significant. All three models show higher proportions at ages 15 to 19 in 1964 than does the 1964 census. This may have resulted because some children aged 3 and 4 in 1953 were reported as 5 and 6 year-olds according to the traditional method of reckoning age in China. This would have inflated the population at ages 5 to 9 in 1953 at the expense of those 0 to 4 and caused the models to show a higher proportion of survivors at ages 15 to 19 in 1964. In this case, the 1964 census age distribution may be more accurate.

The 1964 census also shows much smaller proportions at ages 40 and over than do the models, in spite of the high mortality among the aged which the models assume during the crisis years. Either the mortality among older people was much more severe during the crisis than the mortality schedules used in constructing the models allow for or there was much more exaggeration of ages by the middle aged and elderly in 1953 than in 1964. There is clear evidence of exaggeration in the numbers of persons reporting extremely high ages in 1953, but there is also evidence from refugee reports of the early 1960's that mortality among the elderly was very high during the food crisis years. Both explanations may apply.

How could the 1964 census have done a better job of measuring age than the 1953 census while doing a poorer job of counting heads? It is possible that the 1964 age data are based on only part of the total enumerated population. In 1953 the age data were taken from the population "directly surveyed," excluding the part whose numbers were estimated by more "indirect" means. Perhaps the same was done in 1964. In fact, because of the haste in which the 1964 census was reportedly completed, it is possible that the age data were based on very incomplete reports and extrapolated to the rest of the population. If this is the case, there may be some question as to how adequately the reported age data represent the age distribution of the total population in 1964. If the units providing age data were less severely affected than the rest of the country during the food crisis years, the 1964 age data may understate the effects of the crisis. In general, however, the 1964 census age distribution seems more plausible than the age distribution for 1953, and it may be closer to actuality than the model age distributions for 1964.

Another way of exploring the implications of the incompatibility of the 1964 age distribution and the 1964 population total is to modify the 1953 age distribution and the intercensal vital rates so that the 1964 age distribution can be approximated by a model starting with the 1953 census total. Since the completion of the East-West Population Institute conference paper cited earlier, the author prepared a fourth model for this purpose. Model D begins with a January 1, 1953 total derived from the census total assuming natural increase in 1953 at the level implied by the official totals for yearend 1952 and 1953. The birth and death rates for subsequent years were arrived at by the successive approximation until they produced exactly the census proportions at ages 0 to 4 and 5 to 9 in 1964. The birth rates within the 5-year intervals in which these cohorts were born were adjusted so that they show declining fertility throughout the 1950's, an accelerating decline in 1960–62, and a rebound to a peak in 1963. The death rates decline until 1958, rise at a sharply accelerating rate to a peak in 1961, and then decline rapidly through 1964. At no point does natural increase become negative. To have a negative natural increase rate in 1960 or 1961 would have required much higher natural increase rates in 1962 and 1963, but this would have meant much lower mortality during the latter two years than would be plausible given the reported levels for the 1950's. The population totals and vital rates for Model D are given in table 6.

TABLE 6.—POPULATION TOTALS AND VITAL RATES, MODEL D, 1953–65

[Absolute figures in thousands; vital rates per thousand population]

Year	Jan. 1 population	Annual average population	Crude birth rate	Crude death rate	Natural increase rate
1953	576, 039	582, 641	45. 2	22. 5	22. 7
1954	589, 242	596, 092	43. 8	20. 8	23. 0
1955	602, 941	610, 015	42. 6	19. 4	23. 2
1956	617, 089	624, 458	41. 9	18. 3	23. 6
1957	631 827	639, 020	40. 5	18. 0	22. 5
1958	646, 212	653, 076	39. 3	18. 3	21. 0
1959	659, 940	666, 459	38. 5	18. 9	19. 6
1960	672, 978	678, 691	36. 8	20. 0	16. 8
1961	684, 404	688, 905	35. 3	22. 2	13. 1
1962	693, 405	698, 097	31. 6	18. 2	13. 4
1963	702, 789	712, 234	43. 5	17. 0	26. 5
1964	721, 679	728, 806	35. 1	15. 6	19. 6
1965	735, 932				

Source: See text.

Table 7 shows the percentage age distributions by sex in 5-year age groups for the 1953 and 1964 censuses and the midyear 1953 and 1964 distributions for Model D. As can be seen, the model exactly matches the 1964 census proportions for both sexes in every 5-year age group to the one-hundredth of one percent and all but one of the proportions for males and females rounds to the corresponding 1964 census figures in tenths of one percent. But to secure such a good match, it was necessary to increase considerably the levels of fertility and mortality during the intercensal years and to make some significant modifications in the 1953 age distribution. For both sexes combined, the age group 0 to 4 in 1953 is increased by almost one percent, and increases of over half of one percent are required at ages 15 to 19 and 20 to 24. Throughout the middle of the age distribution the changes are slight, but from age 55 onward, Model D has distinctly smaller proportions. If the 1964 census age distribution is more reliable than that for the 1953 census, the changes would mean that the 1953 census undercounted children at ages 0 to 4 or failed to convert some of their Chinese ages, that it also missed a number of young people at ages 15 to 24, and that many people 55 and over had exaggerated their ages.[30]

TABLE 7.—PERCENTAGE AGE-SEX DISTRIBUTIONS FROM THE 1953 AND 1964 CENSUSES AND FROM MODEL D FOR MIDYEAR 1953 AND 1964

Age group	1953 census			Model D midyear 1953			1964 census			Model D midyear 1964		
	Both sexes	Males	Females	Both sexes	Males	Females	Both sexes	Males	Females	Both sexes	Males	Females
All ages	99.99	100.01	100.03	100.02	100.00	100.01	100.00	100.0	100.0	100.00	99.99	99.98
0 to 4	15.59	15.53	15.65	16.42	16.82	16.00	14.52	14.5	14.5	14.52	14.52	14.53
5 to 9	10.94	11.23	10.63	11.14	11.33	10.93	13.65	13.9	13.4	13.65	13.89	13.40
10 to 14	9.39	9.71	9.04	9.70	9.89	9.50	12.52	12.7	12.3	12.52	12.72	12.31
15 to 19	9.10	9.28	8.91	9.83	10.30	9.33	9.01	9.2	8.9	9.01	9.16	8.85
20 to 24	8.24	8.27	8.21	9.02	9.32	8.70	7.37	7.5	7.3	7.57	7.46	7.27
25 to 29	7.76	7.96	7.55	8.04	8.29	7.79	7.31	7.6	7.0	7.31	7.60	7.00
30 to 34	6.88	7.03	6.72	7.04	7.16	6.92	6.77	7.0	6.6	6.77	6.98	6.55
35 to 39	6.41	6.47	6.35	6.23	6.27	6.18	5.97	6.1	5.8	5.97	6.11	5.82
40 to 44	5.56	5.55	5.57	5.54	5.58	5.49	5.17	5.2	5.1	5.17	5.21	5.12
45 to 49	5.01	4.97	5.07	4.88	4.60	5.16	4.47	4.4	4.5	4.47	4.42	4.52
50 to 54	4.24	4.20	4.30	4.10	3.81	4.39	3.84	3.8	3.9	3.84	3.79	3.89
55 to 59	3.61	3.53	3.70	2.89	2.55	3.24	3.27	3.0	3.5	3.27	3.03	3.52
60 to 64	2.90	2.73	3.08	2.25	1.84	2.68	2.56	2.3	2.9	2.56	2.26	2.87
65 to 69	2.03	1.79	2.29	1.53	1.21	1.88	1.69	1.4	1.9	1.69	1.44	1.95
70 to 74	1.37	1.09	1.68	.74	.60	.89	1.07	.8	1.3	1.07	.83	1.32
75 plus	.96	.67	1.28	.67	.43	.93	.81	.6	1.1	.81	.57	1.06

Sources: See text.

The most important conclusion of this exercise is that the course of vital events in the intercensal period that is required to generate the 1964 census proportions at ages 0 to 4 and 5 to 9 produces a midyear 1964 population total that is 37 million larger than the reported 1964 census total. This would imply that the 1964 census undercounted the population by more than 5 percent relative to the 1953 census. If the 1953 census also undercounted the population by at least 5 percent, as the author has argued elsewhere,[31] the total undercount by 1964 could have been as much as 63 million.

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[30] These conclusions tend to confirm those reached by the author in an earlier analysis of the 1953 age distribution after comparing the census data with age data from other countries with high fertility and mortality and with several stable population models. The earlier study noted marked deficits at ages 5 to 14, less severe deficits at age 0 to 4 and 15 to 24, and an excess at ages 45 and over. See John S. Aird, The Size, Composition, and Growth of the Population of Mainland China, International Population Reports, Series P-90, No. 15, U.S. Government Printing Office, Washington, D.C., 1961, pp. 68–74.

If the 1964 census did in fact add to an already significant undercount in the 1953 census, the implications for current population totals and the forthcoming census are also important. What may have happened to population recordkeeping in the intercensal and postcensal years is not clear. There seems to have been an upsurge in birth registration in 1954 when food grain rationing was instituted, but there was also some evidence that the registers lost track of population in 1955, when recent rural migrants into the cities were expelled under orders to return to their native villages. The Leap Forward probably disrupted population recordkeeping causing further losses in recorded population. During the food crisis years, registration was undoubtedly neglected again, but in the post-crisis recovery period, belated registration may have made up for some of the failures to report births that contributed to the low birth rates of the crisis years. The Cultural Revolution also plunged the population registers into disarray as it did most other civil functions, but there may have been some delayed registration of births in the late 1960's, when, according to some Chinese sources, there was a secondary peak in the birth rates.[32] With the resumption of family planning efforts in the 1970's and especially after their marked intensification in 1973, the need to show achievement in family planning work and success in attaining the target birth and natural increase rates handed down by higher levels may have resulted in an increase in underregistration of births and some falsification of the reported figures on births and natural increase, causing the undercount in the official population totals to rise from 1973 to the present. It would be impossible to quantify the varying margin of undercount over the years, but the general trend has probably been upward, in absolute if not in relative terms. By the time the 1982 census is taken, it may have to close a considerable gap between the previously reported figures and the actual numbers.

The 1976 and 1978 survey data can also be compared with the model age distributions for the same years, even though dating the two surveys poses a problem. The cancer survey age data do not refer to a single date because the survey was not simultaneous. Most of the provinces were surveyed during 1976, but five were not covered until one or two years later. The reporting forms used in the survey field work specify that age data are to be obtained as of the previous yearend, but a participant in the survey says that in practice the age data were collected de novo as of the time of field work in each locality. This would mean that, on the average, the reference date of the survey age data was somewhere between midyear and yearend 1976.[33] The exact reference date of the 1978 survey is also unknown. In table 8, the cancer survey data are compared with model data as of midyear 1976 and the 1978 survey with model data as of midyear 1978, which gives a slightly better fit than the yearend model data.

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[31] John S. Aird, "Population Growth," Chapter 4 in Alexander Eckstein, Walter Galenson, and Ta-chung Liu, eds., Economic Trends in Communist China, Aldine Publishing Company, Chicago, 1968, pp. 242-214.

[32] For example, "It Is Imperative to Control Population Growth in a Planned Way," RMRB, (editorial), Feb. 11, 1980, FBIS, No. 33, Feb. 15, 1980, p. L14.

[33] According to information provided to the author and Judith Banister in an interview in Bethesda, Maryland on May 13, 1981, with Dr. Li Junyao, Deputy Head of the Department of Epidemiology of the Cancer Institute, who participated in the survey.

TABLE 8.—PERCENTAGE AGE DISTRIBUTIONS, 1976 SURVEY, 1978 SURVEY, AND MODELS A, B, AND C AS OF MIDYEAR 1976 AND 1978

Age group (years)	1976 survey	Model A	Model B	Model C	Age group (years)	1978 survey	Model A	Model B	Model C
All ages	100.01	99.99	100.00	100.00		100.0	100.0	100.0	100.0
0 to 4	12.41	12.50	12.21	12.73	0–14	38.6	37.7	36.7	37.7
5 to 9	13.52	14.26	13.59	13.78					
10 to 14	12.35	11.23	12.42	11.12					
15 to 19	9.32	8.44	7.05	8.34	15–29	24.8	25.7	25.4	25.4
20 to 24	9.15	9.45	9.47	9.70					
25 to 29	7.50	8.31	8.42	8.31					
30 to 34	5.95	5.86	5.93	5.87	30–64	31.8	31.2	32.0	31.4
35 to 39	5.54	5.27	5.35	5.29					
40 to 44	5.11	4.94	5.03	4.96					
45 to 49	4.56	4.37	4.46	4.39					
50 to 54	3.91	3.95	4.05	3.97					
55 to 59	3.28	3.33	3.44	3.36					
60 to 64	2.77	2.85	2.97	2.87					
65 to 69	2.01	2.16	2.28	2.18	65 +	4.8	5.4	5.9	5.5
70 to 74	1.39	1.58	1.70	1.60					
75 plus	1.24	1.49	1.63	1.53					

Source: See text.

The cancer survey age distribution is quite similar to the model age distributions, and especially to the Model B distribution, which is based on the absolute birth totals series, at ages 0 to 14, the age groups born since the food crisis years. For the age group 15 to 19, which contains the food crisis cohorts, the cancer survey reports a higher proportion than the models show, more than 2 percentage points higher than in Model B. At ages 20 to 24, the survey has a somewhat smaller proportion than the models, and at ages 25 to 29, the cohorts that were mainly in the 0 to 4 age group in 1953, the survey has almost one percent less. From that point on until ages 65 and over the distributions differ very little. In the advanced ages they diverge, the models showing higher proportions than the survey, another indication that the ages of older persons were exaggerated in 1953.

The cancer survey's higher proportion at ages 15 to 19 tends to support the 1964 census evidence that the crisis losses in infants and children were not as severe as the birth totals and the official population totals imply. The lower survey percentage at ages 25 to 29 also confirms the 1964 figure for this cohort, which was almost one percentage point below what the models showed for the approximately corresponding age group as of 1964. In general, the 1976 survey age distribution seems closer to the 1964 census than to the 1953 census age structure.

The comparison of model data with the 1978 survey data does not permit many inferences because the survey age groups are too large. The distributions are not markedly dissimilar except that, once again, the models have too high a proportion at ages 65 and over due to age exaggeration in the 1953 census. They also show a somewhat lower proportion at ages 0 to 14, which may mean that actual fertility during the period 1964–78 was somewhat higher than the birth totals and official birth rates used in constructing the models indicate. In this respect, the 1978 survey seems to disagree with the 1976 survey, which did not differ significantly from the models in regard to the size of the cohorts born during the period 1962–76.

The foregoing analysis and the conclusions drawn from it rest on various assumptions as to the reasons for the inconsistencies between the various age distributions and the population totals reported in Chinese sources. The inconsistencies themselves are real and demonstrable. The explanations are speculative. All conclusions must therefore be regarded as tentative until more definitive information is available.

PROVINCIAL POPULATION DATA

Some further clues as to the plausibility of the national population data are found in the available provincial population data. Unfortunately, the collection is still rather limited, despite many recent additions. There are no provinces for which population totals and vital rates are complete as those for the country as a whole have been published. Such compilations undoubtedly exist in China and may be available to research personnel in the population research and training centers, but they have not found their way into Chinese scholarly journals. One reason they are not published may be that provincial data series would reveal more anomalies than do the national population data, since there is a tendency for summary data to obscure irregularities more conspicuous in the component figures.

Table 9 gives provincial population totals for 1953, 1957, 1964, 1978, and 1979 and the average annual increase rates for the years between.[34] The figures for 1953 and 1957 have been adjusted in some cases to make them more comparable with the figures for 1964 and 1978, which are given according to the boundaries as they existed between July 1969 and July 1979. The 1979 figures are given as reported, even though those for Nei Monggol, Liaoning, Jilin, Heilongjiang, Gansu, and Ningxia are not comparable with the corresponding figures for 1978 and earlier years because of boundary changes in July 1979 which restored to Nei Monggol the area taken from it and given to the other five provinces in July 1969.[35] The 1978 figures add to a total that is 0.03 million less than the official figure for yearend 1979, and the 1979 figures add to 970.81 million instead of the announced yearend 1979 total of 970.92 million. The reason for these differences is not known.

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[34] The table does not include the one other complete set of provincial figures published by a Chinese geographer in 1957. The figures refer to yearend 1954 and were said to have been based on registration reports, but they add to a total almost 3 million larger than the SSB's yearend 1954 total, and the figures for some of the provinces are not consistent with the 1953 census and 1957 registration figures for the same provinces. The problems are not due to boundary changes and cannot be solved by simple adjustments, hence the 1954 data are not included here. For the source, see Hu Huanyong, "Zhongguo gesheng qu mianji renkou zhishitu" ("A Graph of the Area and Population of China by Province and Region"), Dili zhishi (Geographical Knowledge), No. 9, Sept. 14, 1957, pp. 390–391.

[35] Xinhua, Beijing, Aug. 11, 1979, British Broadcasting Corporation, Summary of World Broadcasts (SWB), Aug. 14, 1979, p. FE/6193/C1/1 (b,W).

TABLE 9.—PROVINCIAL POPULATION TOTALS, MIDYEAR 1953, YEAREND 1957, MIDYEAR 1964, YEAREND 1978, AND MIDYEAR 1979, AND IMPLIED AVERAGE ANNUAL GROWTH RATES

[Absolute figures in millions; growth rates in percentages]

Province, region, or municipality	Population totals					Average annual growth rates			
	Midyear 1953	Yearend 1957	Midyear 1964	Yearend 1978	Yearend 1979	1953–57 [1]	1957–64 [1]	1964–78	1978–79 [1]
North:									
Beijing	(4.53)	(5.47)	7.57	8.50	8.71	6.46	5.14	0.80	2.42
Tianjin	(4.53)	(5.22)	6.28	7.21	7.29	3.21	2.87	.96	2.50
Hebei	(33.74)	(36.96)	39.41	50.57	51.05	2.05	.99	1.73	.94
Shanxi	14.31	15.96	18.01	24.24	24.47	2.45	1.88	2.07	.96
Nei Monggol	(3.53)	(4.38)	6.24	8.90	[2] 18.51	4.90	5.60	2.48	----------
Northeast:									
Liaoning	(22.27)	(26.20)	29.50	37.43	[2] 34.43	3.68	1.84	1.66	----------
Jilin	(12.61)	(14.19)	17.89	24.74	[2] 21.85	2.65	3.63	2.26	----------
Heilongjiang	(12.68)	(15.83)	21.39	33.76	[2] 31.69	5.06	4.74	3.20	----------
East:									
Shanghai	(9.42)	(10.46)	10.82	10.98	11.32	2.34	.53	.10	3.10
Jiangsu	(37.71)	(41.67)	44.50	58.34	58.93	2.24	1.02	1.89	1.01
Zhejiang	22.87	25.28	28.32	37.51	37.92	2.26	1.76	1.96	1.09
Anhui	30.66	33.56	31.24	47.13	48.03	2.03	−1.10	2.88	1.91
Fujian	13.14	14.65	16.76	24.50	24.80	2.44	2.09	2.65	1.22
Jiangxi	16.77	18.61	21.07	31.83	32.29	2.34	1.93	2.89	1.45
Shandong	(50.14)	(55.44)	55.52	71.60	72.31	2.26	.02	1.77	.99
Central-south:									
Henan	(43.91)	(48.34)	50.32	70.66	71.89	2.15	.62	2.37	1.74
Hubei	27.79	30.79	33.71	45.75	46.32	2.30	1.40	2.13	1.25
Hunan	33.23	36.22	37.18	51.66	52.23	1.94	.40	2.29	1.10
Guangdong	34.77	37.56	42.80	55.93	56.81	1.97	1.86	1.86	1.57
Guangxi	19.56	19.39	20.84	34.02	34.70	−.20	1.12	3.44	2.00
Southwest:									
Sichuan	65.69	72.16	67.96	97.07	97.74	2.11	−.92	2.49	.69
Guizhou	15.04	16.89	17.14	26.86	27.31	2.62	.23	3.15	1.68
Yunnan	17.47	19.10	20.51	30.92	31.35	2.00	1.10	2.87	1.39
Xizang	1.27	1.27	1.25	1.79	1.83	−.07	−.24	2.51	2.24
Northwest:									
Shaanxi	15.88	18.13	20.77	27.79	28.07	2.99	2.11	2.03	1.01
Gansu	(11.29)	(12.84)	12.65	18.73	[2] 18.94	2.90	−.23	2.74	----------
Qinghai	1.68	2.05	2.14	3.65	3.72	4.56	.66	3.75	1.92
Ningxia	(1.64)	(1.87)	2.16	3.66	[2] 3.64	2.96	2.25	3.70	----------
Xinjiang	4.87	5.64	7.27	12.33	12.56	3.30	3.98	3.71	1.87

[1] Calculated from unrounded figures where available.

[2] Figures not comparable with those for prior years because of boundary changes.

Note: Absolute population totals for 1953–78 are given according to the provincial boundaries that existed from July 1969 to July 1979. Figures for 1953 and 1957 that are given in parentheses were adjusted by FDAD to take account of boundary changes and to achieve approximate comparability for the figures for the 3 central municipalities and their surrounding provinces. In July 1979, the areas added to Nei Monggol 10 years earlier were returned to the 5 adjacent provinces from which they had been taken. No increase rates can be calculated for 1978–79 for the 6 affected provinces.

Sources:

1953 figures: Zhonghua Renmin Gongheguo dituji, October 1957, pp. 5–6.

1957 figures: State Statistical Bureau, Ten Great Years: Statistics of the Cultural and Economic Achievements of the People's Republic of China, Foreign Languages Press, Beijing, 1960, p. 1, p. 11.

1964 figures: Shijie ditu ce (World Atlas, Ditu chubanshe, Beijing, Feb. 1, 1972.

1978 figures: Provided to the UNFPA Mission Library, Beijing, by a Chinese Government agency in November 1979.

1979 figures: Zhongguo baike nianjian (Encyclopedic Yearbook of China), Zhongguo da baike quanshu chubanshe, Shanghai, August 1980, pp. 62–115.

The figures for 1953 and 1957 given in table 9 pose only two visible problems. One may have resulted from the exchange of four counties and a small municipality between Guangdong and Guangxi, which were traded back and forth several times during the 1950's and 1960's. The 1953 population of these areas was 1.97 million. If this area and its population are assigned to Guangdong in 1957, Guangxi does not have a reasonable rate of growth between 1953 and 1957, and if they are given to Guangxi, the growth rate for Guangdong is too low. There seems to be no satisfactory solution for this problem.

The second problem is with Xizang (Tibet), for which the 1957 figure seems to be a rounded version of the estimate given for 1953. The census figure was apparently obtained by combining a total of 273,969 for the Changdu area with a round estimate of 1,000,000 for Tibet proper.[36] Hence the population totals and growth rates for Xizang in the 1950's are probably not meaningful and even the 1964 figure may be rather arbitrary. Its population may not have grown much if at all during the 1950's Mortality among the Tibetans was high and additional deaths were caused by the efforts of the Chinese army to quell revolt, which drove many Tibetans into exile in India. The influx of Han Chinese into Lhasa was probably not sufficient to compensate for all of these losses. However, the reported figures cannot be taken as an accurate representation of the population growth during these years.

In 1964 figures pose more serious problems. Aside from Xizang, there are three provinces for which the 1964 figures are actually lower than the 1957 figures—Sichuan, Anhui, and Gansu—and there are five others for which the implied average annual growth between 1957 and 1964 is around half of one percent or less—Shandong, Henan, Hunan, Guizhou, and Qinghai. Four others show a marked drop in implied average annual growth during this period as compared with the rates for the prior and succeeding periods, Hebei, Jiangsu, Hubei, and Yunnan. Together, these provinces account for 60 percent of the 1964 census total. Among the remaining provinces, three—Nei Monggol, Jilin, and Xinjiang—had higher growth rates during the 1957–64 period than in any other period and several others seem to have been only slightly affected by the food crisis.

The differences are curious and do not follow a consistent regional pattern. The effects of the crisis were unusually widespread for a Chinese famine, perhaps because it was not a purely natural disaster. Much of its severity and scope was due to the gross mismanagement of land and labor caused by Mao's Leap Forward. The northeast seems to have been virtually unaffected, but the provinces of the east, central-south, and southwest regions were all affected in varying degrees, and the north and northwest regions presented a mixed picture. In some cases provinces that show little or no decrease in population growth during the crisis period border directly on provinces that were among the most severely affected. Such abrupt differences from one province to another were not uncommon in historical Chinese famines, before there were adequate transport systems and a strong and effective central authority, but to find the same situation in the 1960's is rather surprising. In the past, a famine severe enough to cause a net depopulation in a Chinese province attracted worldwide attention. In 1960–61 the world at large was unaware that the food shortages in China were acute enough to have such profound consequences, if indeed they did.

How many provinces might have lost population in 1960 and 1961 cannot be determined without more detailed provincial data, but there must have been others besides the three that had a net loss for the whole period from yearend 1957 to midyear 1964. These three provinces alone lost 6.7 million people between 1957 and 1964, and their losses in 1960 and 1961 must have been considerably greater, since they more than compensated for growth during 1958–59 and 1962–64. If the growth rates in these provinces in the non-crisis years followed the trend of the country as a whole, they would have lost from 12 to 16 percent of their population in 1960 and 1961, which would account for at least two-thirds and perhaps for all of the net loss in the entire country.[37] It is hard to believe that these provinces could have suffered such an extreme calamity without some word reaching the outside world at the time.

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[36] See Hu Huanyong, loc. cit., which gives the same figures for yearend 1954.

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What seems more plausible is that a real decline in population growth in many areas combined with a breakdown in population recordkeeping, so that when the registration records were used in preparing the 1964 census returns, the effects of the famine were exaggerated by defective provincial population totals. This conclusion must remain tentative until more evidence is provided. However, it could be checked by Chinese demographers if they have access to provincial age data from the 1964 census and from more recent surveys. If the same discrepancies between age data and the trends in population growth are found at the provincial as at the national level, then at least a part of the food crisis population losses are a statistical fiction and all subsequent population totals from the provinces showing the discrepancy must remain suspect until confirmed or modified by an independent count.

For the period 1964–78, the average annual growth rates by province show no striking peculiarities. The rates for the three municipalities are much lower than those for the other units, but this is plausible because of the policy of restricting urban growth by preventing in-migration from rural areas, transferring young people out of the cities, and reducing birth rates. Birth control efforts were generally more successful in the cities, and especially the central municipalities, than in the rural areas and their effects were apparent much earlier in the cities. Among the provinces, Hebei and Jiangsu were celebrated early in the 1970's as leaders in birth control work, and Liaoning is the most urban of China's provinces, hence the low average annual growth rates for these provinces are not unexpected. This does not necessarily mean that the rates were accurate. The low rates for Shandong and Guangdong are somewhat unexpected. Shandong had rather little to say about its progress in birth control work until very recent years, and Guangdong has been reporting itself as one of the more laggard provinces in reducing population growth rates. But the provinces with the highest growth rates for the period—Qinghai, Xinjiang, Ningxia, Guangxi, Heilongjiang, and Guizhou—are all provinces which should have had high rates because of high fertility or significant in-migration or both.

The growth rates for the one-year period 1978–79 show the three municipalities increasing in population more rapidly than any of the provinces. This is plausible in view of the return of young people to the municipalities who had been sent to other areas during the 1960's and the early to middle 1970's as part of the "youth to the countryside" program designed to ease urban employment problems. The reflux began in 1978 and has continued up to the present. The growth rates for Anhui and Henan are much higher than their 1979 natural increase rates, and the growth rates for Jiangsu, Jiangxi, Shanxi, Hubei, and Guangxi also seem to be somewhat higher, whereas the growth rates for Shandong and Guangdong are lower than their natural increase rates. Most of these differences are not plausible and suggest a continuation at the provincial level of the persistent discrepancy between population growth and natural increase rates noted in the national figures. The same kinds of discrepancies are probably found in reports from lower units. The difference between the actual rates of growth and the rates reported may be much greater than the differences between the natural increase rates and the derived growth rates, if both the natural increase rates and the population totals are being manipulated to show attainment of family planning targets.

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[37] These figures are based on the assumption that the growth rates for Sichuan, Anhui, and Gansu for 1958–59 and 1962–64 bore the same relationship to the national growth rates as they did for the period 1953–57 and that the national trends for these years were as indicated in models B and C, the models that show the highest and lowest net loss figures, respectively, in 1960–61.

The provincial vital rates, fragmentary as they are, are difficult to rationalize unless data manipulation is a part of the explanation. As was noted earlier, the most rapid decline in the national birth rate during the 1970's occurred at a time when the "gang of four" was supposedly opposing and disrupting birth control work. The trend in the national birthrate cannot be traced back to the provinces because of the lack of data, but provincial natural increase rates, although very incomplete, give some notion of what was supposed to be happening at the provincial level during these years. The figures released thus far have been assembled in table 10.

Among the provincial level units, the decline in natural increase was reported first for the central municipalities. Shanghai was the leading unit, already reporting a natural increase rate below 10 per thousand by 1970. Beijing followed, passing the same level by 1973. Tianjin apparently did not reach a rate as low as 10 until several years later and therefore did not provide figures prior to 1977. In general, the margin of error in the vital rates for the central municipalities is probably small—much less than in those for the provinces—but it could still amount to several points per thousand in the birth and death rates.

Among the provinces, Hebei, Jiangsu, Shanxi, Nei Monggol, Liaoning, Zhejiang, Hubei, Hunan, Guangdong, and Yunnan reported natural increase rates in the low 20's in 1970 or 1971. For some of these provinces, particularly the last five on the list, which are all in the south, the region in which fertility was traditionally highest in China, these rates are surprisingly low and invite suspicion. The rates of 30 per thousand and over given for Anhui, Sichuan, Guizhou, Xinjiang, and Qinghai are more plausible and probably many other provinces for which the early 1970's figures have not yet been released had rates in the same range.

There are two precipitous drops in the provincial figures, insofar as can be determined from the incomplete data. The first occurred between 1973 and 1974 or 1975, as is apparent from the figures for

TABLE 10.—PROVINCIAL NATURAL INCREASE RATES, 1970-80

[Per thousand population]

Province, region, or municipality	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
North:											
Beijing		12.4	11.7	9.7		3.39	2.53	4.02	6.76	7.71	
Tianjin								6.77	9.16	8.66	7.25
Hebei	20.74					8.35		8.75	9.7		
Shanxi	22.9							11.7	9.11		
Nei Monggol		24.1	22.11	21				12.4	12.0	13.2	12.03
Northeast:											
Liaoning		19	18	17				8.87	12.6		8.71
Jilin									14.3	13.89	9.65
Heilongjiang									12.2	12.16	8.64
East:											
Shanghai	8.94	6.88	5.95	4.8	3.36		6		5.07	6.23	5.31
Jiangsu	23.8		[illegible]	12	10.73		10.02	9.97	9.5	8.78	
Zhejiang		19.6						18.6	11.07		7.07
Anhui		30							13.8	13.74	9.9
Fujian									17.86	13.02	9.33
Jiangxi								21.58	19.62	13.74	9.11
Shangong	27.55								10.3	10.79	7.13
Central-south:											
Henan									13.4	12.88	9.55
Hubei		20.98						9.8	10.5		
Hunan	21.65							10.82	10.4		
Guangdong	23.46	23.52	22.52	21.26	17.61	14.97	12.60	12.61	14.75	16.96	14.5
Guangxi								17.6	18.3		
Southwest:											
Sichuan	31.21	28.96		26.92	22.91	20	12.25	8.67	6.07	6.70	4.45
Guizhou		30						19.4	16.0		
Yunnan		24.74							19.23	14.60	10.26
Xizang									14.2		
Northwest:											
Shaanxi								10.8	10.32	10.15	7.19
Gansu									12.2	10.8	8.9
Qinghai		32.4							19.5	18.3	
Ningxia									23.0		
Xinjiang			30.58	30		24.26			14.86	14.8	12.0

Source: 1978 figures to 1 decimal place: Provided to the UNFPA Mission Library, Beijing, by a Chinese Government agency in November 1979. 1978 figures to 2 decimal places and figures for other years: Various Chinese and secondary sources on file at FDAD.

Guandong, Sichuan, and Xinjiang. Some provinces had a further drop between 1975 and 1976 or 1977, but the next major drop is the widespread decline between 1979 and 1980, when a number of provinces reported declines of 2 to 4 points per thousand from rates that were already quite low. Several of these cases seem rather improbable. Guangdong, which had been complaining of being unable to check a rising trend in birth and natural increase rates since 1976, suddenly was able to get its natural increase rate back down below the 1978 level. Sichuan, which had for several years claimed the lowest rate of any of the provinces and been declared a model province in family planning work, turned in a still lower rate in 1980, surpassing even Shanghai.

There is very little in the information available on promotional tactics used in family planning work in the early 1970's that could explain a sharp reduction in provincial birth rates between 1973 and 1974 or 1975, but the general tone of the propaganda seems to have hardened noticeably in 1973, and a marked intensification of efforts can be inferred from local progress reports from that point onward. Instructions to local Party cadres to "grasp" birth control work "firmly," to make it a part of the "fierce struggle between the two classes," to reassert "the dictatorship of the proletariat" in family planning work, and to "strictly control population growth" began about 1973 and became recurrent themes through the middle 1970's. The local leaders were apparently being held responsible for the success of the campaign and were expected to show immediate results.

The drop in 1980 undoubtedy reflects the increasing pressures for achievement of family planning goals during 1979, when the provincial family planning laws authorizing "rewards and punishments" were announced and the one-child family was first espoused. The mounting pressures of 1979 had followed a year of relaxing pressures in 1978, when a national campaign against "commandism, coercion, and other violations of law and discipline" by Party cadres was mounted throughout the country. A number of provinces reported rising birth and natural increase rates in 1979 and others failed to show continuing declines. The resumption of pressures in 1979 that led to lower natural increase rates in 1980 also precipitated a hostile reaction, and, once again, warnings were issued against coercion in family planning work, restrictions on early marriage were relaxed,[38] a new emphasis was placed on contraception as the preferred method for controlling births, presumably at the expense of sterilization and abortion, which were more heavily used in the past,[39] and rising population growth rates were projected for the country as a whole in 1981 and 1982.[40]

The rising pressures for results in family planning work in 1973 and 1979 undoubtedly caused a real decline in population growth rates in many parts of the country, but some foreign observers suspected that increased underregistration of births and falsification of data must be part of the explanation. Falsification of economic data had been exposed and denounced in a number of specific cases from 1977 onward, and since family planning cadres had the same incentives and opportunities to falsify data as did other cadres, it seemed likely that sooner or later instances would be found in that sphere also. The data reported by Sichuan Province particularly strained foreign credulity. Even though Sichuan was said to have been given a special reprimand at the end of 1979 for its excessive use of coercion in birth control work,[41] it seemed unlikely that this very rural province could actually have reduced natural increase from 12.25 in 1976 to 8.67 in 1977, let along bring it down to 6.07 in 1978 and 4.45 in 1980. Guangdong, which called upon local leaders throughout the province to emulate the example of Sichuan and encouraged a rather reckless use of late term abortion in 1979 as a means to that end, has not yet been able to come close to Sichuan's reported achievements. Was it possible that Sichuan could so easily accomplish what proved impossible in Guangdong? Or was the difference due in some measure to greater statistical reliability in Guangdong than in Sichuan? These questions cannot be answered with the information available, but Sichuan's claims must be considered doubtful until there is independent statistical verification.

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[38] The new marriage law, which took effect as of January 1, 1981, raised the minimum age for marriage by two years for both sexes above the levels specified in the marriage law of 1950, setting it at 20 for women and 22 for men, but the new law has been officially interpreted as invalidating administrative restrictions stipulating much higher minimum ages (widely reported during the middle 1970's as 23 and 25 in rural areas). As a result, there has been a flood of marriage registrations in the first months of 1981 as young people rush to take advantage of the easing of restrictions. See, for example, Xinhua, Beijing, Feb. 2, 1981, JPRS, No. 77401, Feb. 17, 1981, pp. 49–50; Xinhua, Beijing, Feb. 10, 1981, FBIS, No. 28, Feb. 11, 1981, pp. L16–17; "Wosheng renkou zengzhanglü lianxu huisheng qushi yijing ezhi" ("The Rise in Guangdong's Population Growth Rate Has Been Checked"), Nanfang ribao (*NFRB*) (Southern Daily), Guangzhou, Feb. 14, 1981, p. 1; "Qunian benshi renkou chushenglü jixu xiajiang" ("Shanghai's Birth Rate Continued Its Decline Last Year"), Jiefang ribao (JFRB) (Liberation Daily), Shanghai, Feb. 18, 1981, p. 1; Xinhua (English), Beijing, Feb. 18, 1981, FBIS, No. 32, Feb. 18, 1981, p. R3; and Jinan radio, Shandong Provincial Service, Mar. 5, 1981, FBIS, No. 44, Mar. 6, 1981, p. 03.

[39] Xinhua, Beijing, Jan. 30, 1981, FBIS, No. 21, Feb. 2, 1981, p. L5; and Beijing radio, Domestic Service, Feb. 25, 1981, FBIS, No. 38, Feb. 26, 1981, p. L2.

[40] According to Chen Muhua, the head of China's newly established Family Planning Commission under the State Council, Deng Xiaoping recently spoke of "the anticipated rise in the population growth rate in 1981 and 1982." See Beijing radio, Domestic Service, Jan. 14, 1981, FBIS, No. 10, Jan. 15, 1981, p. L4.

[41] Michael Parks, "Sex is High on the List of New Chinese Freedoms," the Baltimore Sun, Jan. 25, 1979.

Several recent Chinese sources have indicated that statistical authorities in China are also becoming concerned about the problem of falsification of birth data. In his article of February 1980, Zhu Zhengzhi mentioned for the first time the idea that setting high targets for the population control work could give rise to both coercion and "hiding reports of births." [42] In December 1980, an article in the People's Daily written by a provincial statistician asserted categorically that "in order to show 'success' in planned parenthood, fewer births are reported, thus creating inaccuracies in natural increase rates." [43] In February 1981, Sun Yefang, a leading Chinese economist, wrote in the new economic journal Economic Management that "in order to create a false impression of work in controlling the birth rate, some localities report a smaller number of babies born." [44] Falsifying statistical data to show achievement in high pressure campaigns or fulfillment of targets or quotas mandated by higher authorities is nothing new in China. What is new is the explicit recognition that demographic data are among those being falsified. Evidently the authorities now have reason to believe that falsification of birth data is a significant problem.

If birth and natural increase rates are falsified, it is also likely that population totals will be falsified, especially now that provincial target population figures are being set as part of the campaign to keep the national population total under 1.2 billion by the year 2000.[45] Once they have committed themselves to artificially lowered population totals, many local units may be obliged to cover themselves by seeing to it that the figures they report after the next census do not cause them embarrassment. This could pose a serious challenge to the planners and administrators of the census to make certain that their field procedures and reporting systems are immune from manipulation by local officials. Preventing the falsification of statistics in China is not easy, for reasons which seem to be inherent in the structure of relationships between the central and local authorities and between the statisticians and the political leaders. An understanding of the nature of this phenomenon is essential to a full appreciation of the uncertainty of Chinese statistics.

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[42] Zhu Zhengzhi, loc. cit.

[43] Liu Shuyi, "Tongji yao zhunque, xu li tongjifa" ("Statistics Must Be Accurate; A Law on Statistics Must Be Promulgated"), RMRB, Dec. 21, 1980, p. 3.

[44] Sun Yefang, loc. cit.

[45] For example, Jiangsu has a target figure of 70 million for the year 2000 and 62 million for 1985; Guangdong has a target figure of "below 70 million" in the year 2000. See Nanjing radio, Jiangsu Provincial Service, Feb. 3, 1981, SWB, Feb. 18, 1981, p. FE/W1121/A/; and Guangzhou radio, Guangdong Provincial Service, Oct. 5, 1980, JPRS, No. 76,664, Oct. 21, 1980 p. 72.

IV. FALSIFICATION OF STATISTICAL DATA

In the past four years, Chinese sources have been increasingly frank in discussing the causes and effects of statistical falsification. Their candor is commendable and indicates a determination to come to grips with the problem and solve it. The press has been campaigning against it intermittently since soon after the founding of the SSB in August 1952, but never so intensively as at present.

Falsification is not the only source of inaccuracy; incomplete reporting, defective survey methods, "blind estimating," and other shortcomings have also contributed to the unreliability of the data. But falsification has received special attention because it is deliberate and can introduce more serious distortions than most other sources of statistical error. Probably not even the statisticians in the SSB know the extent of falsification or its impact on particular kinds of statistics, but the statisticians and the political leaders insist that it has been serious enough to cause major miscalculations in planning and administration.

During the Leap Forward of 1958, when, as SSB Deputy Director Li Chengrui puts it, "a gust of the 'wind of boasting and exaggeration' came into being,"[46] the resulting inaccuracies were major. Steel production was exaggerated by more than 3 million tons,[47] and food grain production was reported as one trillion jin when in fact it was only 400 billion jin.[48] Under the "gang of four," it is said that falsification was again rampant, causing "great damage" to economic management. Statistical work throughout the country "almost came to a standstill" between 1967 and 1969 and many statistical organs and a large quantity of statistical data were destroyed.[49] Some Chinese sources imply that the "gang of four" actually advocated falsification of data and deliberately misrepresented trends and conditions in the country. Jiang Qing is alleged to have remarked in confidence to a colleague that "data must be obtained with the needs of the struggle in mind and not for (their) own sake" and that "we should first think of a theme and then look for data . . . (which are) thus used in a flexible manner." These statements are now construed to mean that Jiang advocated the fabrication of data for political purposes.[50]

Jiang and her colleagues are also charged with having embraced the idea that "nothing important can be done without lying."[51] Some sources claim that it was all the fault of the "gang" that the Chinese Communist Party's "fine tradition" of seeking truth from facts was undermined,[52] but others charge the "gang" only with bringing the practice of lying to "its climax."[53] Several sources imply that there has been a considerable reduction in falsification since the fall of the

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[46] Li Chengrui, Statistical Work in New China, State Statistical Bureau, Beijing, November 1979, p. 1.

[47] Liu Shuyi, loc. cit.

[48] Sun Yefang, op. cit., p. L5.

[49] NFRB Commentator, "Yao jiaqiang tongji gongzuo" ("Statistical Work Must Be Strengthened"), NFRB, May 21, 1979, p. 1.

[50] Hua Xiang, "Confessions of Power Pragmatists—Criticizing Jiang Qing's Confidential Remarks to Liang Xiao," GMRB, May 2, 1978, JPRS, No. 71366, June 27, 1978, p. 64.

[51] Niu Geng and Tao Sha "A Tentative Analysis of 'Telling Lies,' " GMRB, Jan. 7, 1980, JPRS, No. 75074, Feb. 15, 1980, p. 34.

[52] For example, see RMRB Commentator, "A Warning Against Liars," RMRB, July 8, 1980, Xinhua, Beijing, July 8, 1980, FBIS, No. 133, July 9, 1980, p. L1.

[53] Nui Geng and Tao Sha, loc. cit.

[54] For example, see Nanchang radio, Jiangxi Provincial Service, Sept. 28, 1978, FBIS, No. 192, Oct. 3, 1978, p. G9.

"gang" and that only a few units still fabricate figures,[55] but others say that "telling lies is still quite common,"[56] that in the country as a whole resorting to deception is "not isolated,"[57] and that "the trend toward lying is not checked but has spread."[58] Looking back over China's recent statistical history, one source says that statistical data were "relatively good during the initial period of the founding of the PRC, but it has basically all been a mess since 1957."[58]

KINDS OF FALSIFICATION

No type of data or record seems to have been spared, but among the cases exposed in the public media, those that relate to agriculture are the most numerous. In 1977 two Gansu counties in which the level of grain production was low were designated "learn from Dazhai" counties, one of which reported increased grain production in a year when it declined about 20 percent.[59] In 1978, a Hunan county that had been a "learn from Dazhai" county but had suffered a drop in grain production for three successive years was exposed for reporting increases instead.[60] In June 1980, a Guangdong commune was criticized for having reported rising grain production since 1977 and an all-time high in 1979 when production had actually fallen each year.[61] In July 1980, in the most startling exposure to date, Xiyang County, Shanxi Province, which contains Dazhai Commune, for many years the model for emulation by agricultural units throughout the country, was unmasked as a fraud. For five years, from 1973 to 1977, the county authorities had "lied" about grain output, reporting on the average 24 percent more grain than had actually been produced. In some parts of the county the people had actually been going hungry.[62]

Land under cultivation is often falsified by understatement in order to exaggerate yield per mu. In March 1980, a Beijing paper said that Hunan Province had reduced its cultivated land figures by 4 million mu between 1958 and 1960 and had not yet corrected the data. Local units in the province kept one set of fairly accurate records for making work assignments and another set of falsified figures for use in reporting to higher levels.[63] In January 1981, the People's Daily reported that aerial surveys made in 1979 disclosed that a county in Beijing Municipality and another in Jilin Province had underreported cultivated acreage by 7.8 and 25.8 percent, respectively.[64]

Other kinds of units and other kinds of data were also susceptible. The Tianjin Number 2 Light Industry Bureau discovered in 1978 that many of the enterprises under its authority had exaggerated or understated production and gross value data.[65] An Anhui county finance and revenue bureau that had been declared an advanced unit was exposed for engaging in embezzlement.[66] The Taiyuan Municipal Mechanical and Electrical Equipment Company was discovered to have concealed profits and withheld state revenues.[67] The Baoding Woolen Mill in Hebei, one of China's leading textile mills, lied about production results for several years, falsely claimed that its 1976 output level was "the best in history," was declared a "Daqing-type enterprise" and commended by a central government figure in 1977, and was exposed in 1978.[68] A Beijing county grossly underreported the numbers of administrators it employed in order to claim high achievement in simplifying administration.[69] The Central Ministry of Petroleum told the enterprises under its jurisdiction that part of the oil output in a given year could be left unreported so that it could be added to the reported production in a year when output was low.[70] A unit of the People's Liberation Army Militiamen falsified the number of soldiers achieving "excellent" ratings in marksmanship by lowering the requirements.[71] Apparently any kind of data, record, and report is subject to falsification if there are advantages to be gained.

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[55] Contributing Commentator "It Is Necessary to Grasp the Essentials of Investigation and Research," RMRB, Oct. 16, 1980, FBIS, No. 214, Nov. 3, 1980, p. L13.

[56] Sun Yefang, op. cit., p. 16.

[57] Niu Geng and Tao Sha, op. cit., p. 33.

[58] Contributing Commentator, loc. cit.

[59] Lanzhou radio, Gansu Provincial Service, Sept. 26, 1977, FBIS, No. 188, Sept. 28, 1977 pp. M1–2.

[60] Changsha radio Hunan Provincial Service, Aug. 31, 1978, FBIS, No. 173, Sept. 6, 1978, pp. H1–2.

[61] "Jielu xugong fukua shishidi de baodao" ("To Expose an Exaggerated and Unfounded Report") NFRB, June 18, 1980, p. 2.

[62] Xinhua, Beijing, July 8, 1980, FBIS, No. 133, July 9, 1980 p. L1.

[63] Tang Yingzheng "Nongye tongji bao jiashu de xianxiang bixu zhiuzheng" ("The Phenomenon of Falsifying Agricultural Statistics Must Be Corrected"), GMRB, Mar. 20, 1980, p. 2.

[64] Yue Ping, "Strengthen Statistical Work," RMRB, Jan. 19, 1981, JPRS, No. 77571, Mar. 12 1981 pp. 2–3.

CAUSES OF FALSIFICATION

The reasons why falsification occurs vary somewhat from case to case but there are several principal causes. Most of the instances in the past few years seem to have arisen from efforts of local Party and government officials to please their superiors by reporting good news that can then be passed on up the chain of command to keep the higher levels happy. One source explains that

> In some places, departments, and units, individual responsible persons, disregarding facts, want you to reflect that "the situation is excellent," and you cannot report bad news but have to do everything possible to report fulfillment and overfulfillment of plans; or they want you to reflect "great achievements in increasing production and practicing economy," and you have to report that all economic and technical indicators have been reached or surpassed the highest past records; or they want you to achieve "a per mu output of over 1,000 jin," and you have to report more than the actual output on less than the actual acreage . . . Otherwise you are not serving politics.[72]

What can happen when bad news is reported is vividly described by another source:

> If some of the reported production does not exist, it is because some leading comrades immediately carry out criticism the moment they hear that production has declined, saying, "What the hell are you up to? Is grain production that low?"

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[65] Tianjin radio, Tianjin City Service, Sept. 5, 1978, FBIS, No. 177, Sept. 12, 1978, pp. K3–4.

[66] Hefei radio, Anhui Provincial Service, Nov. 24, 1978, FBIS, No. 230, Nov. 29, 1978, pp. G2–3.

[67] Taiyuan radio, Shanxi Provincial Service, Dec. 1, 1978, FBIS, No. 234, Dec. 5, 1978. p. K4.

[68] Wang Wenjie and Lu Zuyi, "The Baoding Woolen Textile Mill Should Be Stripped of Its Title as a Daqing-Type Enterprise," Xinhua, Beijing, Dec. 4, 1978, FBIS, No. 235, Dec. 6. 1978, pp. K1–2.

[69] Xinhua Beijing, Feb. 8, 1979, FBIS, No. 31, Feb. 13, 1979, pp. H4–5.

[70] Sun Yefang, op. cit., p. L6. The concealed oil was referred to as "pocket oil."

[71] Sian radio, Shaanxi Provincial Service, May 6, 1978, FBIS, No. 90, May 9, 1978, p. M3.

[72] "Statistics Must Be Truthful," (editorial), RMRB, Dec. 7, 1979, FBIS, No. 242, Dec. 14, 1979, p. L12.

> Comrades criticized in this way then go back to their local units to "carry out work" and compel the lower levels to report a greater output.[73]

In many cases the lower levels do not wait for a signal from above as to what sort of news is preferred:

> Some comrades working in lower level organs lie to higher level organs and the leading comrades because they fear that the higher levels will be displeased if they are told the truth . . . (They) say: "After smashing the 'gang of four' . . . the situation has become increasingly better . . ." no matter what the actual situation (is). This (is) because they (are) afraid that the higher levels would be displeased or that they might be criticized if they did not say these kinds of things. . . . We must not solely blame the lower levels for these occurrences.[74]

Another cause of falsification is the fact that during mass campaigns all units are usually required to select at least one component as a "model unit" or "typical example" for emulation by others. The more success claimed for these units, the more praise they win from higher levels. As a result, model unit data are often falsified.

The press has sometimes helped to fabricate "typical examples," and some newsmen are said to believe that such fabrications are both necessary and "legitimate." [75] Based on the reports of the model units, the higher authorities sometimes set unreasonable targets for all the rest. The People's Daily complained in 1978 that "some leading departments even issue output targets which can never be fulfilled." [76] The lower levels, faced with impossible demands, are then driven to falsify the data for the non-model units. When exaggeration is widespread, those officials who only report actual attainment are compared unfavorably with the others, hence the practice is hard to eliminate, as another source notes:

> Why is it always so difficult to do away with lying? This is because we are placed in a situation where speaking the truth gives one the bad end of a deal and lying puts one in an advantageous position. . . . To do away with lying, the leadership must create objective conditions for telling the truth. . . . It must not force those below to do the impossible or to do anything silly or incompatible with objective laws.[77]

Local leaders also falsify data for their own personal advantage. One source says that the leaders use false models as their "capital" in claiming personal recognition and awards.[78] Those who report exceptionally good news quickly rise to fame.[79] The former "principal person" in the Party Committee of Xiyang County, which contains Dazhai Commune, "personally attended meetings and forced commune Party secretaries to falsify reports," as a result of which he and his associates "became famous and got promotions." [80] One source offers it as a generalization that those who falsify figures are "given advancement and put in important positions." [81]

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[73] Wuhan radio, Hubei Provincial Service, Nov. 16, 1978, FBIS, No. 224, Nov. 20, 1978, p. H5.

[74] Contributing Commentator, loc. cit.

[75] Nanning radio, Guangxi Regional Service, Jan. 12, 1978, FBIS, No. 10, Jan. 16, 1978, pp. H15–16.

[76] "Play the Role Well as the Department Supplying Technical Equipment for the Four Modernizations," RMRB (editorial), Sept. 21, 1978, Xinhua, Beijing, Sept. 20, 1978, FBIS, No. 185, Sept. 22, 1978 p. E6.

[77] Niu Geng and Tao Sha, op. cit., pp. 33 and 35.

[78] Tang Yingzheng, loc. cit.

[79] Wang Wenjie and Lu Zuyi, op. cit., p. K1.

[80] RMRB Commentator, loc. cit.

[81] Liu Shuyi, loc. cit.

Not only are the incentives strong but the deterrents are weak. The falsifiers apparently have little fear that they may be exposed and punished. Although the offenders are warned that they are bound to be caught eventually, that they "can fool people some of the time but not all of the time,"[82] and that they will, in the end, be "exposed and toppled,"[83] some sources say that it is not the falsifiers but those who attempt to expose them who run the greater risk. People who protest against falsification or try to complain to higher authorities are often subject to "vengeful attacks,"[84] or accused of "negating the excellent situation,"[85] "opposing Dazhai," or "chopping down the Red Flag,"[86] or denounced as "right opportunists."[87] When they refuse to falsify figures, they are told this means that they are disobedient to the Party.[88] One cadre who exposed false reporting was subjected to "criticism and struggle" for 7 to 8 months and another was "framed as an embezzler, active counterrevolutionary, (and) never-repentent capitalist-roader, subjected to investigation in isolation and cruel struggle, and persecuted to death."[89]

The falsifying officials, on the other hand, are able to cover up their deceptions in most cases because they hold positions of power. In the case of Xiyang County, there had been complaints about the falsification of data several years before the final exposure, and some of the members of the county Party committee at one point admitted their fraud, but later they denied it and forced others to go along with them. In this case, "a handful of leaders relied on their power and position to protect the lies."[90] Liu Shuyi adds that falsifiers are "secure in the knowledge that (they have) strong backing." How this protects them against whistle-blowers is explained by Liu as follows:

> When a case is reported to higher authority, usually no one is sent down directly to conduct an investigation. Often the reports are sent back to the units and many of them end up in the hands of those being reported on or their associates. The persons who have exposed and reported on the cases are subjected to retaliation. . . . There are popular sayings now in circulation that "whoever exposes and reports to the higher authorities suffers the consequences" and "those who are punished are not the ones who overreport and falsify but those who oppose such practices."[91]

As a result, the local leaders are at liberty to alter statistical figures "at will"[92] and "without any legal constraints."[93]

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[82] Commentator, "Eradicate the Evil Wind of Resorting to Deception," RMRB, Dec. 5, 1978, FBIS, No. 235, Dec. 6, 1978, p. E14.

[83] Nanchang radio, Sept. 28, 1978, p. G4.

[84] Fuzhou radio, Fujian Provincial Service, Aug. 31, 1978, FBIS, No. 171, Sept. 1, 1978, p. G3; "Tongji gongzuo yao jianchi shishiqiushi wei sihua fuwu; chuanguo tongji juzhang huiyi tiqu cong liuge fangmian giajin he tigao tongji gongzuo" ("Statistical Work Must Persist in Seeking Truth from Facts to Serve the Four Modernizations; the All-China Conference of Directors of Statistical Bureaus Recommends Six Ways to Improve and Enhance Statistical Work"), JFRB, Apr. 13, 1979, p. 3; Xinhua, Beijing, Nov. 11, 1979, FBIS, No. 221, Nov. 14, 1979, p. L5; and Yue Ping, op. cit., p. 4.

[85] "Wosheng zhaokai tongji gongzuo huiyi qiangdiao fahui tongji gongzuo zai sihua zhong de zuoyong" ("Guangdong Province Convened a Statistical Work Conference to Stress and Bring into Play the Role of Statistical Work in the Four Modernizations"), NFBR, May 21, 1979, p. 1.

[86] RMRB commentator, loc. cit.

[87] Niu Geng and Tao Sha, op. cit., p. 34.

[88] "Statistics Must Be Truthful," p. L13.

[89] Xinhua, Beijing, Feb. 8, 1979, p. H5.

[90] RMRB commentator, loc. cit.

[91] Liu Shuyi, loc. cit.

[92] Yue Ping, op. cit., p. 4.

[93] Liu Shuyi, loc. cit.

The power of the falsifiers derives from the fact that they are, in most cases, the leaders of the Party committees of the units involved. The falsification of county grain data in Gansu reported in 1977 was attributed to an unidentified "person" in the Gansu provincial Party committee and his "followers." [94] A 1978 report from Jilin Province attributed the falsification of country data to the former "principal person" in the provincial Party committee.[95] In such positions they control virtually the only effective channels of communication to higher levels and are thus able to see to it that the top leadership is kept in ignorance whenever it suits their purposes. Therefore, as Liu Shuyi points out, an official who falsifies data is usually not exposed unless he gets into trouble politically.[96] In the case of Xiyang County, it was only when the leadership of the county Party committee was changed that the falsification of the county's statistics was "finally brought to light." [97]

At times the tendency of local Party leaders who falsify data has been reinforced by attitudes and policies of the central Party leadership. The worst case in point is the Leap Forward, when the top leadership, in effect, invited the lower levels to engage in deception. During the First Five-Year Plan period, when the SSB was under the directorship of the noted economist Xue Muqiao, it tried hard to establish a national statistical system capable of producing data that could be used to gain an objective measure of the effectiveness of policy implementation throughout the country. The system had many serious problems, as the annual statistical conferences noted, but it seemed to be making progress until 1958. Early in that year, the central Party leadership espoused what was called the "Hebei reform" in statistical work, which consisted essentially of giving the Party leadership at all levels complete control over the production and submission of statistical data. The statisticians were directed to adopt an "ardent spirit," to pay less attention to rules and technical matters, to provide figures that would inspire the masses to achieve a "high tide" in production,[98] to let the masses do statistical work so that the statisticians could devote 80 percent of their time to "trade and production," [99] to "accept Party leadership" over statistics, and to guarantee to Chairman Mao that they would realize a big leap forward in statistics.[100] When they asked whether this method of doing statistical work would not adversely affect its accuracy, they were told that it would make statistics more accurate.[101] They were even encouraged to "follow the example of the eight immortals crossing the sea" and use statistical data to boast about local progress in production.[102] The result was fraudulent production figures which led the leaders to believe that China now had a glut of surplus grain. They authorized wasteful grain consumption and started a fallow land program, both of which contributed to the famines of the next few years. As Sun Yefang has remarked, a high price was paid in blood for this misadventure.[103]

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[94] Lanzhou radio, Gansu Provincial Service, Sept. 26, 1977, FBIS, No. 188, Sept. 28, 1977, pp. M1-2.

[95] Changchun radio, Jilin Provincial Service, Oct. 8, 1978, FBIS, No. 202, Oct. 18, 1978, p. L3.

[96] Liu Shuyi, loc. cit.

[97] RMRB Commentator, op. cit., p. L2.

[98] "Two ways of Doing Statistical Work," (editorial), RMRB, Apr. 20, 1958, American Consulate General, Hong Kong, Survey of China Mainland Press, No. 1775, May 20, 1958, pp. 4-6.

[99] "Big Leap Forward in Statistical Work in Heilongjiang." Tongji gongzuo (Statistical Work), No. 14, July 29, 1958, American Consulate General, Hong Kong, Extracts from China Mainland Magazines, No. 145, Oct. 13, 1958, p. 44.

[100] "Wei zhengzhi douzheng fuwu, wei shengchan douzheng fuwu, zai ge ji dangwei lingdao xia, guanche zhixing junzhong luxian kuzhan sange yue shixian quanguo tongji gongzuo da yuelin" ("Fight Bitterly for Three Months to Realize a Big Leap Forward in Statistical Work Throughout the Country Under the Leadership of the Party Committees and Thoroughly Carry Out the Mass Line to Serve the Political Struggle and the Production Struggle"), Tongji yanjiu (Statistical Research), No. 7, July 28, 1958, pp. 1-4.

Even after the statistical fiasco of the Leap had become unmistakeably apparent and its causes were discussed at a symposium of heads of statistical bureaus in April 1959, the Party leaders did not immediately change their policies on statistical work. Those statisticians who had warned that Leap methods would undermine the reliability of statistics and had been proven correct were denounced as "right opportunists" and silenced.[104] Xue Muqiao, who had resisted the more extreme forms of Party intervention and had tried in 1959 to point out the lessons of the experience to an unreceptive Party leadership, was also subjected to criticism.[105] In October 1959, he was removed from his post as director of the SSB and was replaced by his former deputy, Jia Qiyun, who reaffirmed that statistics must be "the willing tool of the Party," advised the statisticians that "the Party's demands, suggestions, and directives are logical and scientific," and warned them not to insist on their own figures but to "humbly" accept "the opinions of the Party leadership." [106] The statisticians had no choice but to obey.

In April 1962, in a new directive on statistics issued by the Party Central Committee and the State Council, Zhou Enlai and Liu Shaoqi attempted to repair the damage done to statistics by the Leap and to reaffirm the authority of the SSB. New "provisional" regulations on statistics were issued in March 1963 [107] in which Zhou included an explicit provision that "Party and government departments were forbidden to change statistical figures," [108] but the problem of Party meddling was not solved. On the eve of the Cultural Revolution, the third director of the SSB, the late Wang Sihua, was criticized on the grounds that he was following a "revisionist" line, "seizing power from the Party," and "asserting his independence." [109] Then followed the Cultural Revolution and the utter destruction of the statistical system, a major setback in China's long struggle to attain statistical accountability.

Since Mao's death, the central leaders have once again espoused objectivity and accuracy in statistics and reaffirmed the primacy of the

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[101] "All Party and People to Engage in Statistical Work," (editorial), RMRB, Aug. 13, 1958, American Consulate General, Hong Kong, Survey of China Mainland Press, No. 1839, Aug. 25, 1958, p. 29.

[102] Sun Yefang, op. cit., p. L5.

[103] Ibid.

[104] Jia Qiyun, "Take Up the Weapon of Statistics and Strive to Oppose Rightists Opportunism so as to Protect the General Line of the Party," Jihua yu tongji (Plans and Statistics), No. 12, Sept. 23, 1959, JPRS, No. 2513, Apr. 14, 1960, pp. 2–3; and "Fan youqing, gu ganjing, wei jiaqiang tongji gongzuo de dang xing er nuli" ("Oppose the Rightist Tendency and Summon Up Energies to Strive for the Strengthening of Statistical Work of a Party Nature"), Jihua yu tongji (Plans and Statistics), No. 14, Oct. 23, 1959, pp. 3–4.

[105] Qiu Jian, "An Economist's Approach to Learning—Profile of China's Noted Economist Xue Muqiao," GMRB, Feb. 12, 1981, FBIS, No. 42, Mar. 4, 1981, p. L18.

[106] "Fan youqing, gu ganjing, wei jiaqiang tongji gongzuo de dangxing er nuli," pp. 6–7.

[107] Li Chengrui, Statistical Work in New China, loc. cit.

[108] Sun Yefang, loc. cit.

[109] Ibid.

SSB in coordinating and leading statistical development, but the local Party and government leaders still interfere in statistical work. They remain the principal source of falsification. Liu Shuyi says that "in most instances those who have practiced overreporting and falsification are not the statistical departments and the statistical clerks but are, often, the leadership of certain units." [110] Sun adds that "the tendency of Party and government leaders to meddle in statistical figures and make false reports has not been eliminated." [111] Two other writers say that within Party ranks "the phenomenon of lying" is still present.[112]

One reason for the persistence of the problem is that the central authorities have not given a clear indication as to what the relationship between local statisticians and local leaders should be. On the one hand, they repeatedly urge the local leaders to "strengthen their leadership" over statistical work [113] and state categorically that the local statistical departments are not to be independent of Party control [114] but are to render statistical services to the local leaders in addition to meeting the requirements of the SSB. On the other hand, they encourage statistical personnel to "struggle against . . . leadership personnel who commit fraudulent acts" and assure them that in so doing they are not violating the "principle of centralized Party leadership in statistical work" but are actually "defending and upholding this principle." [115] Indeed, they have "the right to wage uncompromising struggles against all acts of deception and falsification." [116] Maintaining the accuracy of statistics is said to be essential if statistics are to serve as the "overseer," the "staff officer," and the "eyes and ears" of the central Party leadership [117] and become a "powerful weapon in the hands of the leadership organs of the Party and state at all levels in effecting supervisory control over and struggle against fraudulent practices and violations of law and discipline." [118]

However, this puts the lower level statisticians in the awkward position of maintaining a kind of surveillance over their superiors. Some statisticians see a contradiction between the requirement that they render statistical services to their local leaders and at the same time produce statistics that higher levels can use to supervise and inspect the work of these same leaders. The relationship between the service and supervisory functions was discussed at some length at a national symposium on statistics convened in Emei County, Sichuan, in December 1978. The conclusion of the discussion was that these two functions "are not opposites but a dialectical unity," [119] but some of the statisticians find this answer confusing.[120] Sun Yefang has called upon the central leadership to "further clarify the independence which statistical work should duly have." The current arrangement subordinates the local statistical departments to the local planning committees, and, Sun says, "practice has proved that this system is not favorable for giving full play to the function of statistics departments as organs of inspection and supervision." Instead, he suggests that the statistical organs be placed "under the direct leadership of the State Council or the government in different localities." [121]

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[110] Liu Shuyi, loc. cit.

[111] Sun Yefang, op. cit., p. L6.

[112] Niu Geng and Tao Sha, loc. cit.

[113] For example, see Shenyang radio, Liaoning Provincial Service, June 24, 1977, FBIS, No. 126, June 30, 1977, p. L5; "Give Full Play to the Role of Statistics as an Overseer," RMRB (editorial), Apr. 3, 1979, Beijing radio, Domestic Service, Apr. 3, 1979, FBIS, No. 71, Apr. 11, 1979, p. L14; and Xining radio, Qxinghai Provincial Service, Jan. 15, 1980, FBIS, No. 18, Jan. 25, 1980, p. T3.

[114] "Statistics Must Be Truthful," loc. cit.

[115] "The Study of Statistical Theory to Meet the Needs of Modernization," Jingji yanjiu (Economic Research), No. 4, Apr. 20, 1979, JPRS, No. 74161, Sept. 12, 1979, p. 37.

[116] "Statistics Must Be Truthful," p. L12.

[117] "Give Full Play to the Role of Statistics as an Overseer," p. L13; "Tongji gongzuo yao jianchi shishiqiushi wei sihua fuwa: quanguo tonji juzhang huiyi tichu cong liuge fangmian gaijin he tigao tongji gongzuo; loc. ct.; "Statistics Must Be Truthful," loc. cit.; Li Chengrui, op. cit., p. 10; and Yue Ping, loc. cit.

[118] "The Study of Statistical Theory to Meet the Needs of Modernization," loc. cit.

[119] Ibid.

[120] NFRB Commentator, loc. cit.

Thus far the central authorities have not taken steps to remove the local statistical departments entirely from local control. Instead, they have continued to exhort the local leaders to stop meddling in statistics and the local statisticans to resist such interference. For the central leaders, the issue is also a thorny one. In the campaign to end falsification they have allied themselves with the central and local statisticians against the local Party and government leaders, yet they are still dependent upon these leaders as the instruments of central power at the local community level and therefore cannot afford to assume a wholly adversarial posture toward them. The recent campaigns for cadre reform and against "violations of law and discipline" have already put some strain on the relationship between central and local authority and there are limits on how much it can bear.

A NATIONAL STATISTICAL LAW

One other proposal that has been under discussion for the past several years is the passage of a new law designed to strengthen the hands of the statisticians in dealing with falsification. This proposal apparently has the support of many statisticians. At the December 1978 symposium, the delegates reportedly urged that provisions be added to the laws of the state "to ensure the truthfulness of statistical figures, to prohibit false reporting, . . . to determine the official responsibilities, powers, and duties of those concerned with statistical work . . . ," [122] to protect the rights of statistical personnel "in their persistence in seeking truth from facts," and to define the legal liabilities of those who "hit back in revenge and violate the regulations of the Party and the laws of the State." [123] Liu Shuyi said that a new statistical law was "not only extremely necessary but also imperative," [124] and Sun Yefang proposed that the new law be approved and enforced by the Standing Committee of the National People's Congress and that provisions concerning statistics be included in the national constitution.[125] Work on such a law is already going forward. A draft version was discussed and revised at a national conference of statistical bureau directors sponsored by the SSB in Beijing in January 1981.[126] Obviously, this proposal has the support of the Party leaders.

A law on statistics would certainly draw more public attention to the campaign against falsification and might also encourage the local statisticians to adopt a bolder attitude in dealing with local officials. But unless the law is reinforced by an effective arrangement for reporting violations directly to a central agency with the authority to investigate complaints, it is uncertain how much it would accomplish. Legal deterrents, even if backed by supporting institutional arrangements, may not succeed as long as the administrative relationships and central policies that provide the inducements to falsification and the means for covering up such activities are not changed. While high pressure mass campaigns, targets, quotas, model units, and emulation continue to be the tactics by which programs are promoted and statistical data are the means by which cadre performance is judged, the incentives to falsification will still be present, and local ingenuity will find new ways to evade central control. It seems unlikely that the problem can be solved without fundamental organizational changes that will assure the independence and security of the statistical organs even when reporting bad news. Such changes will not occur overnight. As Liu Shuyi says, "safeguarding statistical objectivity and accuracy is still a long-term and complicated struggle." [127]

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[121] Sun Yefang, op. cit., p. L8.

[122] "The Study of Statistical Theory to Meet the Needs of Modernization," loc. cit.

[123] Tongji gongzuo yao jianchi shishiqiushi wei sihua fuwu; quanguo tongji juzhang huiyi tichu cong liuge fangmian gaijin he tigao tongji gongzuo," loc. cit.

[124] Liu Shuyi, loc. cit.

[125] Sun Yefang, op. cit., p. L9.

[126] Xinhua, Beijing, Jan. 6, 1981, FBIS, No. 4, Jan. 7, 1961, p. L1.

Meanwhile, the cumulative effects of past falsification are deeply embedded in the country's basic statistics. When statistical work is at last able to get down to reality, it is likely that many statistical series will have to undergo substantial revisions. Most production statistics will probably have to be revised downward and many demographic measures upward, not only for current years but for the past as well. Higher population totals, birth rates, and death rates could mean a paper setback for the family planning and health programs and more moderate expectations for the future. Such sober statistical readjustments cannot be undertaken lightly, for they implicitly constitute an admission of past misfeasance and misjudgment at all levels. But the rest of the world would take them as grounds for increased confidence not just in China's statistics but in the courage and rationality of its leaders and the firmness of their determination to put national planning on a sound basis.

V. THE 1982 CENSUS

Doubts about the reliability of China's demographic data were at least one of the reasons why the Chinese leaders decided that it was time to take another census. These doubts are usually not expressed openly in the public media or even in conversations with foreigners. Many Chinese statisticians and scholars continue to insist that China's population data are all extremely accurate, that population registration is complete because of its connection with grain and cloth rationing, and that local functionaries have personal knowledge of the demographic particulars of their communities and can therefore make sure that all data are faithfully recorded. But in the past several years, some statisticians have begun to be more candid. Several have questioned the accuracy of population data in general, some have conceded that there were serious problems with the 1964 census, some are troubled by the persistent discrepancies between the national natural increase rates and the growth rates implied by the official population totals, and others admit that urban population registration is incomplete, that births and deaths are underreported, and that infant mortality is probably higher and life expectancy lower than the official data show.

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[127] Liu Shuyi, loc. cit.

Some of these observations have found their way into the public domain. The two articles already cited which acknowledge that birth data have been falsified to show success in family planning are the most conspicuous and forthright examples, but there are others. Several news items from major municipalities have complained about the lack of control over unregistered migrants into urban areas and about the failure of urban residents whose registration was transferred elsewhere to leave the cities.[128] In March 1981, a People's Daily article answered those who thought registration data made a new census unnecessary by pointing out that registration data "often (are) not accurate enough, due to various limiting factors" and explained that the census would supply "relatively accurate facts and figures."[129] This is as close as any public source has come to stating directly that registration data are not sufficiently accurate to meet current administrative requirements.

Of course, as the same article notes, there are other reasons for taking a new census. The census will collect types of data not now available from any sort of record, survey, or investigation and will add greatly to the national stock of statistical data. It will provide a set of socioeconomic data that should serve for years as the basis for analytical studies and for sample surveys. It will answer many questions about Chinese society that are unanswerable at present. Still, the primary function of the new census will be to establish beyond reasonable doubt China's current demographic situation and gain for China an international demographic credibility it has never previously enjoyed. The census is important not just as a source of needed data but also as a contribution to national prestige.

UNIQUE ASPECTS OF THE NEW CENSUS

In several important respects, the 1982 census is unlike its predecessors. It is a far more ambitious project because of the vastly greater amount of data to be collected. Not only has the population grown much larger in the interim, but the items on the schedule are more numerous and several are much more difficult to define and categorize. In 1953 and 1964 the number of items was limited to keep the investigation simple. The 1953 census had only five—name, sex, age, nationality, and relationship to head of household. The registrars were also to record on the top of the form whether the community in which the household resided was urban or rural. The 1964 census added education, occupation, and class status.[130] Even so, both censuses encountered obstacles. In 1953 the conversion of Chinese ages to ages in completed years caused problems, and many Chinese ages were recorded as given instead. The distinction between permanent and temporary residents and the requirement that data be recorded as of a critical date that was, in many cases, long past by the time the enumeration took place added to the difficulties. In 1964 the data on education and occupation were apparently recorded in such disorder that they could not be tabulated.

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[128] For example, see Yang Naichao and Zhang Baocheng, "Qieshi kongzhi Beijing renkou de zangzhang" ("Earnestly Control the Population Growth of Beijing"), Beijing ribao (BJRB) (Beijing Daily), Nov. 30, 1980, p. 1; and "Jinnian benshi jijie zengjia renkou yi da wuwan" ("The Numbers of the Mechanically Increasing Population of Beijing Have Reached 50 Thousand"), BJRB, Nov. 20, 1980, p. 1.

[129] Commentator, "A Census is Essential to Economic Readjustment and the Four Modernizations," RMRB, Mar. 25, 1981, FBIS, No. 65, Apr. 6, 1981, p. K9-10.

[130] There is some disagreement among Chinese sources as to this last item, but it was included in an account given by an official of the SSB in November 1979 to the U.S. Statistical Delegation to China.

The new census will include all of the items in the previous two (except for class status) and more than a dozen others. Exactly how many has not been decided, as of this writing, and will not be until October 1981, but among those that have been considered are date of birth, place of birth, place of family origin, marital status, age at marriage, number of children ever born and number surviving (to be asked of women old enough to have had children), births and deaths in the household during the previous year, and (for urban residents only) the amount of housing space, type of residential structure, condition of structure, and kinds of facilities and equipment available in the unit (e.g., running water, heating, plumbing, cooking facilities, etc.).

With so many more items to cover, the forthcoming census will require more enumerators, more extensive enumerator training, more time per household for interviewing, more elaborate recording of responses, and a much more sophisticated plan for tabulation. In 1953 there were 2.6 million census workers, in 1964 5.3 million, and there are to be over 6 million in 1982. On the other hand, the time allowed for completion of field work has been shortened. In 1953 the counting went on for about 11 months, and teams of enumerators went from area to area within each province, thus requiring fewer census personnel. In 1964 the field work was reportedly completed in about two weeks. In 1982 it is expected to be done in 2 or 3 days. The 1953 census was combined with voter registration, which required setting up election committees and the investigation of voter qualifications, causing further delays, but even without this added function the 1982 census is a more complex affair. To handle the vast quantities of data that must be processed, the Chinese census authorities are counting on the support of an integrated network of computers linking the provinces with Beijing. The computer hardware will come mainly from the United States, the software from Japan. A preliminary hand tally of population and households is to be made at local levels, after which the census schedules are to be sent to regional processing centers where some 5,000 operators will enter their contents on disc for transmission to the regional computers. There the provincial data will be compiled and sent on the master computer in Beijing.

Even with the aid of the computers, however, the task is formidable. The census planners seem not to have fully appreciated its scope at the outset. They were much impressed with what computers could accomplish, and it was on this basis that they increased the number of items to be included. They were less aware of the organizational complications until they began to assimilate the advice of foreign census experts and to experiment with census-taking.

PLANNING THE CENSUS

From the start, the planning of the new census was markedly different from the planning of the two previous censuses. In 1953, the planning process was not discussed in public until after the promulgation of the Government Administration Council's census directive of April 6, 1953. By that time, the details of the plan were already laid down, and they were not altered significantly thereafter even following the so-called "experimental" census work that took place throughout the spring and summer of 1953. Foreign advice was sought in 1953, but only from the Soviet Union, and it is not clear how much use was actually made of it. On the whole, the approach to planning in 1953 was more a priori and less empirical than current census planning. How the 1964 census was planned is not known outside China. The 1964 census was never mentioned by Chinese press and radio before, during, or after the count and recent descriptions have little to say about this aspect of the work.

For the forthcoming census, the preparations have been very careful, foreign and domestic advice has been extensively sought and utilized, and great flexibility has been shown in modifying plans and time schedules as the work has gone forward. The census planning delegation from Beijing that visited the U.S. Census Bureau in the summer of 1979 asked for and received detailed briefings on all aspects of census work and a considerable quantity of census manuals, forms, and publications. The SSB sent two staff members to Washington in January 1980 for training in demography at the Census Bureau's International Statistical Programs Center and four more in August 1980 to study demography and programming. Also in the summer of 1980, 17 Chinese statisticians were sent to Japan for training in computer technology, two of whom studied census techniques in the statistics bureau under the Prime Minister's Office. In the fall, a group of Japanese census experts were to be sent to China to provide additional instruction.[131] In October 1980, SSB Director Chen Xian went to Tokyo to learn more about Japanese census methods.[132] The UNFPA mission in Beijing also provided advisors on census-taking both from the United States and Japan. U.N. advisors have been able to participate in some of the census planning meetings and exchange ideas with their Chinese colleagues. In these contacts, the Chinese statisticians and officials have shown great eagerness to learn about foreign census technology and to adapt foreign methods to China's needs wherever appropriate.

The census plans have undergone considerable evolution since they were first disclosed. In July 1979, when the Chinese census planning delegation began its international tour, the plans for the new census were at a very early stage of development. At that time, the planners said that they were thinking of using again the methods they thought had worked so well in 1953 and 1964. Field organization, enumeration procedures, use of a standard census hour, and the method of checking on the accuracy of the count were to be essentially the same. The only innovations were to be the additional items and the use of computers. The planners professed great confidence in the existing population records and the ability of local leaders to recall and report demographic data. They said that China had an advantage over some other countries in census work because of a higher degree of "organization" in Chinese society. They also repeated the claim that the 1953 census had achieved a net undercount of only 0.116 percent and added that the 1964 census had reduced undercount to 0.0014 percent, which, they noted, was an improvement!

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[131] KYODO-English, Tokyo, Aug. 7, 1980, FBIS, No. 155, Aug. 8, 1980, p. D1.
[132] KYODO-English, Tokyo, Oct. 2, 1980, FBIS, No. 194, Oct. 3, 1980, p. L10.

These remarks caused some dismay among American specialists in Chinese statistics because they seemed to show a lack of awareness of the limits of practical reality in mass statistical undertakings and implied that little had been learned from the shortcomings of 1953 and 1964. Contemporary descriptions of the 1953 census "recheck" activities make it clear that many units had done only perfunctionary checking at best and had then reported few errors or none at all. Such checking was incapable of discovering mistakes and could not provide a true measure of the accuracy of the count. The expression of confidence in the 1964 census was also disconcerting in view of the indications that it had been a statistical fiasco. If the Chinese statisticians knew about the problems, why were these censuses to be taken as models for the much more demanding census in prospect?

The original timing of the new census also seemed unrealistic. In July 1979, the census planners were still talking hopefully of running a pretest in October and the full-scale enumeration in the middle of 1980. Presently these plans had to be abandoned. The computers they wanted to use required a U.S. export license that had to be cleared with the military. Obviously there was no way that China could receive the computers in time for such an early census date. To foreign demographers, by then very much in sympathy with the Chinese efforts to take a successful census, there seemed to be a real danger that haste and inadequate planning could lead to another statistical disaster that the statisticians and political leaders of China could ill afford.

These concerns turned out to be premature. As the planning continued, the time schedule for the census was revised. First, the pretest was put off to July 1980 and the full-scale enumeration to July 1981. Then the census date was left indefinite for a time. Finally, the census date was set for July 1, 1982. According to UNFPA officials working with the Chinese census planners, it was not just the lack of computers that caused the revisions in the census timetable. After studying the materials on census-taking acquired by the census planning delegation during its tour and conferring with UNFPA advisors, the census planners began to realize that they had not allowed enough time to prepare for so complex an undertaking. The results of the first pretest also indicated a need for further preparatory work.

The pretest took place in Wuxi Municipality and Wuxi County, Jiangsu Province, an area with a population of 950,000.[133] Although without even a single computer the Wuxi returns could not be subjected promptly to computer analysis as originally planned, observation of the pretest showed that there was more work to be done. It was decided that additional experimental censuses should be conducted in various parts of the country before the final version of the census procedures was adopted. The first of the IBM computers reached Beijing in the fall of 1980 and is now being used to train operators and for systems generation. The processing and analysis of the Wuxi returns is now expected to occur in June or July of 1981.

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[133] A SSB official said that the pretest area had a population of 1.6 million in 440,000 households. However, one recent Chinese source gives the combined total for Wuxi city and county as 950,000, and another gives the figure as 960,000. The reason for the discrepancies is not known. See Xinhua-English, Beijing, Mar. 9, 1981, FBIS, No. 46, Mar. 10, 1981, p. L1 and "Nationwide Census," Beijing Review, No. 14, Apr. 6, 1981, p. 6.

The plans for the full-scale enumeration include provisions for a post-enumeration "recheck" as was done in 1953 and 1964, but, contrary to initial impressions, the methods to be used this time are quite different. In the Wuxi pretest, a 1 percent sample was re-enumerated at the suggestion of UNFPA advisors by a field staff different from the personnel who did the original count. This same method is to be used to check a 0.1 percent sample of the returns in the full-scale enumeration. Other details of the new recheck procedure have not been made public yet, but, from what is already known, the new methods are likely to solve some of the previous problems.

The deliberateness of the planning, the openness in discussing plans with foreign specialists, the willingness to change plans and time schedules as circumstances warrant, and the down-to-earth approach to problems all testify to the seriousness of purpose with which the census planners and their political superiors approach this great task. They refer to it as "China's first modern population census," and they obviously want to make sure that it is done well.

CENSUS PREPARATIONS

Meanwhile, organizational and experimental work have been going forward throughout the country and propaganda work is beginning. The organizational developments are difficult to trace with the limited information available, but it appears that there was some confusion in the early stages. The authority for census plans and arrangements seems to be in the hands of a census "leading group" under the State Council, the personnel of which have not been identified. On March 9, 1981, a national census office was set up and Vice-premier Chen Muhua was put in charge, making her the director of China's third census.[134]

Provincial census directors must have been appointed some time earlier, since pilot censuses have been under way in a number of provinces from as early as June 1980, which would surely have required established organizations and leadership. Jiangsu, Yunnan, Heilongjiang, Jilin, Nei Monggol, Shaanxi, and Hebei have already conducted such censuses.[135] Also, it is likely that the provincial directors would have been in place long enough to become familiar with their duties before they were summoned to the national conference in March 1981.

The main focus of the 14-day conference seems to have been the pilot censuses. The directors were told that experimental census work was "an important task" and an essential foundation for full-scale census work. Among other things, the pilot censuses were to help in the development of the final census "documents"—presumably the directives, instructions, and forms to be issued later—in the training of census personnel, and in checking on the construction of the provincial computer centers. The directors were also told that, after the conference, all provincial level units were to "continue to take a census in selected areas."[136] This seems a little strange, because it implies that the conference came not at the beginning of pilot census work, when it might have provided guidance for it, nor at the end, when it might have summarized the results, but in the middle. Perhaps the conference was called because the census "leading group" felt that the pretesting was not being taken seriously enough or not being done properly.

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[134] Ibid.
[135] Xinhua, Beijing, Mar. 24, 1981, FBIS, No. 56, Mar. 24, 1981, p. L1.

The methods used in pilot census taking do not seem to have been standardized by the State Council's directions. Yunnan Province followed the Wuxi model by limiting its pretest to Kunming Municipality,[137] and Hunan Province has planned its experimental census for late May 1981 in Yiyang Municipality,[138] but Jiangsu Province has called for census field tests to be conducted "at every administrative level."[139] Fujian expects to carry out field tests "in all prefectures, municipalities, and counties" during the first half of 1982,[139a] and Sichuan has planned a number of local pilot projects.[140] Shandong is doing it both ways: field tests have already been carried out in Jining Municipality and Jining County and all of the province's counties and municipalities are to carry out field tests during the first quarter of 1982.[140a] Apparently the provincial authorities have been allowed some discretion in this matter.

They also seem to have a certain amount of latitude in the design of the schedules to be used in pilot census-taking, since the final census schedule has not yet been determined. It was "suggested" to the provincial census directors that, besides name, age, sex, nationality, and education, they should add items they "deemed appropriate," such as trade, occupation, marital status, and number of children ever born.[141] This obviously means that no standard schedule has been issued for the pilot censuses hence not all provinces will have prior experience with all the questions that may appear on the final census schedule. It also means that the central guidance of provincial census work is still rather loose. Greater control will have to be exercised when the full-scale census takes place if standard procedures and high quality field work are to be assured.

The Chinese census authorities are also concerned about building strong local census organizations, choosing high quality cadres for census work, and inspiring the census staff to do a conscientious job. Jiangsu officials were told that the census leadership teams must be composed of leading members of the local Party committees and that local census directors must be highly competent cadres.[142] The Party leaders were also instructed to attach great importance to the work, build a strong work force, support the necessary transfer of personnel to census work, and demand that their subordinates observe high standards of performance.[143] Several sources warn that the task is "arduous and heavy" and that they must get started early because the time remaining before the census date is very short. Chen Muhua has called upon provincial census directors to be "meticulous, thorough, accurate, and strict."[144]

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[136] Ibid.

[137] Kunming radio, Yunnan Provincial Service, Nov. 22, 1980, JPRS, No. 77809, Dec. 31, 1980, p. 107.

[138] Changsha radio, Hunan Provincial Service, May 8, 1981 FBIS, No. 92, May 13, 1981, p. P1.

[139] Su Guizhang, "Shengzhengfu zhaokai renkou pucha gongzuo huiyi yanjiu bushu youguan shiyi zhuajing jinxing mingnian renkou pucha zhunbei gongzuo" ("The Jiangsu Provincial Government Convened a Population Census Work Conference to Study and to Make Arrangements for Grasping Tightly the Preparatory Work for Next Year's Population Census"), Xinhua ribao (XHRB), (New China Daily), Nanjing, May 2, 1981, p. 1.

[139a] Fujian Provincial Population Census Office, "Sheng renkou pucha baogongshi zhuren huiyi yanjiu bushu zhuajing jinxing renkou pucha gongzuo" ("Conference of Directors of Population Census Offices in Fujian Province Studies and Makes Arrangements for Grasping Population Census Work"), Fujian ribao, May 18, 1981, p. 1.

[140] Chengdu radio, Sichuan Provincial Service, May 6, 1981, FBIS, No. 88, May 7, 1981, p. Q1.

[140a] "Quansheng disanci renkou pucha Jining shidian xianchang huiyi qiangdiao jiaqiang lingdao zuohao renkou pucha zhunbei" ("The Third Provincial Population Census Field Test Conference Stresses the Strengthening of Leadership Over Doing Census Preparations Well"), Dazhong ribao, July 13, 1981, p. 1.

[141] Xinhua, Beijing, Mar. 24, 1981, loc. cit.

The national meeting of provincial census directors in March 1981 was followed immediately by a round of provincial meetings for local census directors. Jiangsu held a meeting on April 24–28 and called upon its prefectures and municipalities to hold similar meetings. Sichuan convened a meeting from April 30 to May 3 and Hunan from May 3 to 7. The meetings served to transmit the documents and directives from the Party Central Committee and the State Council delivered to the provincial directors earlier which instructed all units on the procedures for establishing census organs, staffing, training, and other preparatory efforts, thus launching census work throughout the country.

Propaganda work is also beginning in earnest. The 1979 census planning delegation had shown particular interest in the methods used by the host countries to encourage popular cooperation with census-taking. In August 1980, the State Council's census "leading group" met with U.S. Embassy officials in Beijing to request that the U.S. Census Bureau send them sample promotional materials used during the U.S. 1980 census publicity campaign, including specifically newspaper advertisements, slides, brochures, and a typical promotional film. Domestic propaganda got under way in China in March 1981 with the previously cited article in the People's Daily addressing popular misconceptions about the need for and the importance of the new census. The article called for a gradual start-up of publicity work on a national scale during 1981 so that a full-fledged effort could be mounted in 1982. The stated objective is to "make every household and every person understand what the census means."[145]

Aside from the pilot censuses, the most important aspect of the preparatory work now under way is updating population registration records and compiling from them a household address list. In 1953, many urban units began their census preparations with an effort to bring their household records up-to-date. In March 1981 the provincial census directors were told that "conscientious efforts should be made to sort out and consolidate" the household records so that they could provide a "solid foundation" for census work.[146] At the Jiangsu provincial census conference, the public security police from Lianyungang Municipality reported on their experiences in "straightening out" household registration.[147] Guangzhou Municipality began checking residences in mid-June 1981 and will continue until the end of the year, in an effort to make sure that "residence registration corresponds to actual residence." [147a] Fujian reported that

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[142] Su Guizhang, loc. cit.

[143] Commentator, "Tigao renshi jiaqiang lingdao gaohao renkou pucha" ("Heighten Awareness, Strengthen Leadership, and Do Well in Population Census-taking"), XHRB, May 2, 1981, p. 1.

[144] "Woguo jiang jinxing disanci quanguo renkou pucha" ("China Will Carry Out Her Third Nationwide Population Census"), GMRB, Mar. 10, 1981, p. 1.

[145] Commentator, RMRB, Mar. 25, 1981, p. K10.

[146] Xinhua, Beijing, Mar. 24, 1981, loc. cit.

> During the ten years of catastrophe household control was disrupted. The household registration regulations were not implemented earnestly. Some households are still on the records without having anyone in the households and vice-versa. There is a serious separation of people and households.[147b]

Obviously household registration in some areas in not in very good order.

REMAINING PROBLEMS

Dependence on household registration is one problem of census methodology inherited from the censuses of 1953 and 1964 that has still not been solved. Like its predecessors, the new census will not use large-scale maps or household lists compiled in door-to-door surveys to make sure that no households are omitted. The census will depend for its completeness on the address lists taken from registration records. If despite "straightening out" these records are not complete, the census will also be deficient. In the Wuxi pretest, it is reported that the census count came very close to the population total obtained by registration, but this does not mean much if the census was limited to households in the registers. Unregistered households would not be counted in either. The linking of registration and census records means that neither is sufficiently independent to provide an effective check on the completeness of the other. If the post-enumeration re-check activities sample from the same basic household list, they will also be unable to provide a measure of the undercount caused by unlisted households.

Another problem with the current census arrangements is that a major share of the costs of census-taking is to be borne by the local governments at all levels. The only reference thus far in Chinese sources to the funding of census activities is a statement in a news item from Jiangsu that "funds needed for population census work and other necessary material requirements must be assured and furnished according to the principle of diligence and thrift by the people's governments and financial departments at all levels.[148] Not only the wage costs for the more than 6 million enumerators but also costs of supplies, forms, travel, and conferences evidently are at local expense. This can amount to a substantial outlay for the local governments, and those with limited resources may be tempted to cut corners where they can, particularly if local officials see the census as an unnecessary burden that benefits primarily the national government. The result may be less than conscientious census work. However, even with UNFPA help, there was probably no way the central government could have absorbed all of the costs of local census-taking. The contribution of local resources was required for the first two censuses and for the cancer epidemiology survey as a matter of necessity, and the same undoubtedly applies to the 1982 census.

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[147] Su Guizhang, loc. cit.

[147a] Guangzhou radio, Guangdong Provincial Service, June 25, 1981, FBIS, No. 137, July 17, 1981, p. P1.

[147b] Fujian Provincial Population Census Office, loc. cit.

[148] Commentator, XHRB, May 2, 1981, loc. cit.

A growing concern about the 1982 census is its dependence on a computer network that is still not in place with barely a year remaining until the census critical date. A special export license was obtained for the one computer now on hand by dint of a major expediting effort by U.S. Embassy and State Department personnel in cooperation with the UNFPA mission. The license for the remaining computers was held up for many months because of objections by U.S. military authorities that they could be used for military purposes, but on June 16, 1981 it was disclosed by U.S. Secretary of State Alexander Haig that export of the additional computers was has now been authorized.[149] Even so, the timing will be very tight. The Chinese government is now committed firmly to the July 1, 1982 census date and has set its organizational machinery in motion. A further postponement is probably out of the question, even if the Chinese computer personnel find that they have insufficient time to get their network established and tested and to acquire experience in its operation before the processing of data begins. With all that can go wrong in such situations, the dependability of the computer network will be a matter of concern until the system is shown to be in good working order.

A final concern about the 1982 census arrangements is that census results which contradict population data previously submitted by any locality may be falsified to prevent the exposure of previous data manipulations. Falsification could enter the census reporting system at several points. A unit that needs to report a low population total could drop some households from the census address list so that their representatives are not summoned to the registration stations during the census-taking. Or heads of household could be directed to underreport household membership or to treat some members as temporary residents who should be included in the de jure population. Or the preliminary tallies could be adjusted before being reported to higher levels and enough of the completed census schedules withdrawn so that the machine tally would not contradict the hand tally results. Manipulations of this kind probably could not be detected either by the "recheck" activities or by the computer.

The need for falsification may be eliminated in areas where a conscientious job updating the population registers has already disclosed previous underreporting and corrected it, but it is unlikely that the job could be done conscientiously against the wishes of a local Party leader. Continuous inspection of local census activities by higher level cadres might inhibit but not eliminate falsification by local authorties. What is really needed is an arrangement that would transmit all local census forms or copies of them to the processing centers prior to the hand tallying, so that the local census data are a matter of external record before the local authorities see the totals. This would at least prevent manipulation of the forms themselves and make falsification of the hand tally results pointless, but this idea may be impractical. In any case, some method must be found that can insure that the census returns are recorded as received and committed intact into the national record.

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[149] Bernard Gwertzman, "U.S. Decides to Sell Weapons to China in Policy Reversal," New York Times, June 17, 1981, pp. A1 and A16.

IMPORTANCE OF THE CENSUS

Even though not all of the problems of census-taking the China may be solved satisfactorily by the time the counting begins, the 1982 census will certainly be a demographic landmark of worldwide significance. Aside from the fact that it will be the largest population count ever taken, the census will provide an empirical basis for the reconstruction of the last several decades of China's demographic history and for projections of future population growth and structural trends. It will either confirm previously reported national, provincial, and local population totals or require retrospective adjustments of earlier figures to achieve more plausible series. It will yield age and sex data that can be used to estimate the true levels of fertility, mortality, and natural increase in recent years. It will make it possible to trace the demographic consequences of the Leap Forward, the Cultural Revolution, the rural health program, the rustication of urban youth, and the family planning program. It will supply the demographic data needed to project future requirements of food, clothing, employment opportunities, housing, health services, education, transportation, communications, consumer goods, social security, and other commodities and services. It will permit a more adequate study of relationships between human and natural resources and other issues of critical importance for national policy in China. It will answer many questions which hitherto could only be subjects for speculation. It will make China's demographic experience a part of the world's fund of demographic knowledge and thus further China's integration into the world community. We can only wish the Chinese great success in this momentous undertaking.

THE LABOR FORCE OF CHINA, 1957-80

By John Philip Emerson [1]

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[1] Foreign Demographic Analysis Division, Bureau of the Census.

I. INTRODUCTION

What are the major determinants of productive work? The classical answer is land, labor, and capital. Labor is the subject of this report. This introduction gives a brief general summary of land and capital as endowments of the labor force of China, the education and skills that Chinese workers bring to the labor market, and the economic policies that guide the work that individuals do. These key elements of production shape and limit whatever workers do wherever they may be, but they differ greatly within countries and from one country to another. This statement may be useful to Western readers who wish to understand the organization of the labor force and the working of the economy of China, since the factors of production, education, and economic policies in China differ so much from what people in the West know and and take for granted.

A. The Setting

Passing the billion mark in 1978, according to one widely used estimate,[2] the population of China is the world's largest. However, the size of the population of China is not matched by large endowments of the two other main factors of production—land and capital. In fact, the Chinese people have much smaller shares of these factors of production than people in most other countries. For example, although China has the largest land area of any country in the world after the Soviet Union and Canada, less than 15 percent is arable. The rest consists of deserts, mountains, swamps, and subarctic regions incapable of sustaining an agricultural population. The arable portion, divided by the population of the country, gives China one of the smallest per capita allotments of arable land in the world, 0.098 hectares per person in 1977,[3] as compared with 1.726 hectares per person in the United States in 1974, or nearly 18 times as much.[4]

This indicator of the per capita endowment of arable land, one of the most important factors of production in most economies, is especially important in China, where 80 percent or more of the population are peasants who depend on what they produce on tiny allotments of land for most of their income and their very survival. In 1980, several senior officials of the People's Republic of China (PRC) noted declines in arable land per capital. According to one recent study, arable land per capita fell from .21 hectares in 1952 to 0.090 hectares in 1980.[5-6] During these years the peasant population grew by more than 60 percent,[7] but arable land decreased from 107 million hectares in 1957 to 99 million in 1977,[8] a decline of 7.5 percent overall.

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[2] U.S. Department of Commerce, Bureau of the Census, Foreign Demographic Analysis Division computer run of Chinese population projections.

[3] John Erik. "As China's Fields Disappear, Food Supply Worries Grow," The Asian Wall Street Journal, May 21, 1981, p. 4.

[4] U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, Washington, D.C., 1980, p. 30 (population data) and p. 690 (land data).

[5-6] John Erik, loc. cit.

[7] There were 503 million people in rural China at the end of 1952, according to Data Section, Tongji gongzuo (Statistical work) (hereafter TJGZ), no. 11, June 14, 1957, p. 24. The 1979 agricultural population is given as 813.56 million in Zhu Zhuo's article on rational distribution of China's population in Renkou yanjiu (Population research) (hereafter RKYJ), no. 3, 1980, p. 12.

[8] John Erik, loc. cit. Erik's figures differ little from those used by Liu Zheng in RKYJ, no. 1, 1980, p. 16, who cites arable land totals of 1.6 billion mou in 1957 and 1.5 billion mou "now" [1979?]. Both sets of figures indicate a decline in arable land per capita of 6–8 percent.

Comparison of the per capita ratios of other major economic inputs—electric power, steel, cement, and timber, to name a few available to China and to other countries—will generally show China far down the list.

Extremely dense concentrations of peasants in fertile deltas and river plains are highly visible expressions of low arable land to man ratios. In the lower Yangtse River Valley densities of 775–1000 persons per square kilometer are not uncommon.[9] In the Chengdu plain in Sichuan, densities rise to 1,200 person per sq. km.[10]

Urban areas are also generally crowded. Housing in new cities is usually in very short supply, and in old cities has been allowed to deteriorate with little or no replacement of run-down buildings until the last few years. Chinese authorities have recently acknowledged the extremely critical situation of housing in China today.[11] At the start of 1979 the return en masse of urban youth sent to rural villages and state farms, some of them more than 10 years ago, led to further overcrowding. In Shanghai the unplanned arrival of hundreds of thousands of people, many of them no longer youthful, produced mobs that roamed the streets shouting slogans and demanding household registration, ration coupons for food and cloth, and other perquisites enjoyed by legal city residents.[12] One first hand observer of the Shanghai scene describes it as follows:[13]

> One must be aware of conditions in Shanghai to appreciate fully the scale of the problem [caused by the return of educated youth]. There is a crushing housing shortage in this city of more than 10 million. Cases of five or more adults living in one room of 20 square meters with neither toilet facilities or running water are quite common. People are on the streets all the time just walking around with nowhere to go.

For the last 20 years migration to and from rural areas has been strictly controlled by government regulation and little permanent rural-to-urban migration has been permitted,[14] in keeping with strict limitation of the growth of urban population. One consequence of the enforcement of the almost total ban on rural-to-urban migration is that most Chinese peasants live and die in the same district where they were born. Those born in poor areas are likely to live their whole lives in poverty. Thus, at least for the present rural poverty has been institutionalized under the Chinese Communist Party (CCP or Party) policy on migration.[15]

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[9] Theodore Shabad, "China's Changing Map," New York, 1972, p. 87.

[10] T. R. Tregear. "China: A Geographical Survey." New York, 1980, p. 209.

[11] For an updated account, see Karen Berney, "China's Housing Crunch," The China Business Review, March–April 1981, p. 16.

[12] The Shanghai case is related in Thomas B. Gold, "Back to the City: The Return of Shanghai's Educated Youth," The China Quarterly (CQ), no. 84, December 1980, pp. 755–770.

[13] Ibid., p. 765.

[14] Estimates of net rural-to-urban migration since 1949, given in Zhu Zhuo, loc. cit., vary from 25 million to 12 million, or from 800,000 to 400,000 persons per year. However, short term rural-to-urban migration has been very large in some years, especially in times of trouble or exceptional social and/or economic change. An outline of short-term migration in selected years of the 1950's, given in John Philip Emerson, "Manpower Absorption in the Nonagricultural Branches of the Economy of Communist China, 1953–58," CQ, no. 7, July-September 1966, pp. 76–80; a discussion that includes the early 1960's as well is given in John Philip Emerson, "Employment in Mainland China: Problems and Prospects," in Congress of the United States. Joint Economic Committee. An Economic Profile of Mainland China, Washington, D.C., 1967, pp. 420–422 (hereafter cited as Emerson. 1967).

[15] A summary of data on chronically poor counties is given in Ministry of Agriculture and Forestry, People's Commune Administrative Bureau, "Ijiuchichi nian zhi ijiuchijiu nian quanguo qiong xian gingkuang" (Poor Counties in China: 1977–79). Nongye jingji congkan (Agricultural economics collection). No. 1, 1981, and reprinted in Xinhua yuebao (New China monthly) (hereafter XHYB), no. 2, Mar. 31, 1981, pp. 117–121. A detailed discussion of rural poverty is given in Nicholas R. Lardy, Agriculture in "China's Modern Economic Growth", chapter 4, forthcoming in 1982.

Arable land per capita is clearly a constraint on food production. Great increases in the proportion of land under irrigation and in double cropping, in supplies of improved seeds including high yielding varieties of dwarf wheat and rice, in the application of chemical fertilizers and other improvements in agricultural technology have done little or nothing to offset the negative effects of the falling arable land to man ratio on food production. Food production has barely kept ahead of the increase in population. In 1979, on the basis of grain production statistics and rural population figures, Chinese officials were reporting that more than 200 million peasants [or one in four] "were in a permanent state of hunger." [16] The Chinese application to the United Nations for famine relief assistance made in the spring of 1981 underscores the continued presence of famine in China today,[17] where the population still lives from one harvest to the next. In the winter and spring of 1980–81 famine conditions obtained in large areas of Hubei (population 46 million) and Hebei (population 51 million) provinces, afflicting 20 million people in the former and 23 million in the latter province.[18]

One of the most revealing generalizations that can be made about the relationship between agricultural production and population in China concerns food consumption. According to disclosures by senior Chinese officials in 1980, following the collapse of the Big Leap Forward in 1959 and famine conditions in many parts of China in 1960 and 1961,[19] food consumption levels of the 1950's were not regained until the late 1970's.[20] However, this recovery of average per capita caloric intake may be more apparent than real, since it depends on a poorer diet than Chinese enjoyed in the 1950's, that is substitution of rough for fine food grains, smaller and/or poorer supplies of protein, i.e., smaller rations of cooking oils, marked declines in soybean production, and poorer supplies of vitamins as fresh fruit becomes scarcer.

B. The Decline and Revival of Statistical Work: 1958–81 [21]

In economically developed countries most people seldom have any reason to question the statistical data they use, and most of them would be justified in not wasting time inquiring about the origins of these data. But in many economically undeveloped countries statistics cannot be taken for granted. In such countries political weakness often goes hand in hand with economic weakness. Political leaders of these countries often consider economic statistics as a kind of political intelligence that is potentially threatening to their political fortunes, and therefore tend to discourage the development of statistics, or to keep them from public view if they are developed. This has been true of the Soviet Union from the beginning to the present. It was true of the early years of the Republic of China, the late 1920's and early 1930's. It has been and still is true of the PRC.

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[16] This figure was still being cited a year later. E.g., Zhengming (Contention), July 1, 1980, pp. 5–6, translated in Foreign Broadcast Information Service, Daily Report: China, (hereafter cited as FBIS), July 9, 1980, p. U2.

[17] A historical survey of recent famines and the mechanics of famine in China are given in Walter H. Mallory, "China: Land of Famine," American Geographical Society, Special Publication, No. 6, New York, 1926.

[18] Figures are given in a table by Karen Berney, entitled "Food Aid for China," The China Business Review, May–June 1981, p. 47.

[19] Grain production in 1960 fell to 143 million metric tons, 26.4 percent below the 1957 total of 195 million metric tons. The 26.4 percent fall is reported in an article on the need to limit urban population by Jing Jiwu, Renmin ribao (People's daily) (hereafter RMRB), Aug. 21, 1979, p. 3.

[20] Nicholas Lardy, loc. cit.

[21] This section summarizes a much longer and more detailed review of major developments in economic statistics from the onset of the Big Leap Forward to the present that will appear in an expanded version of this chapter in a Bureau of the Census International Population Reports, Series P-95 report. Persons with professional interests in the development of national economic statistics in China are referred to this report. It is hoped that the following resume will meet the needs of general readers.

The centralized system of national statistics in China built up by the State Statistical Bureau (SSB) under the direction of Xue Muqiao between 1957 and 1958 without exaggeration can be called the creation of Xue himself. As his final act as Director of the SSB, Xue opposed efforts of local (e.g. provincial) CCP secretaries to seize control of statistical work from the SSB in 1958.[22] He failed and was removed from his position as SSB Director in the next year, almost certainly because he refused to budge from his stand that statistical work should be free of manipulation by the Party. A recent SSB pamphlet describes the statistical fiasco that followed in one sentence: "towards the end of the fifties, a gust of 'wind of boasting and exaggeration' came into being and caused serious inaccuracies in some statistical figures."[23]

Writing in an unofficial capacity on past upheavals in statistical developments, Sun Yefang, China's foremost economist, speaks in the plainest language of the great damage done to the centralized organization of statistics in 1958. To illustrate how SSB officials reported "whatever CCP and government leaders wanted them to report," Sun cites a false claim of 1,000 billion catties of grain produced in 1958 as compared with actual production of 400 billion catties, as well as a report of 10.7 million tons of steel produced in the same year, a report made to show "fulfillment of plan targets," as compared with actual production of 8 million tons. He notes that these and similar exaggerations "made people even more reckless," that similar false reports were made in 1959 and 1960 and that this kind of blindness and theory of will [power] led to disaster. As evidence of the last assertion, Sun cites a rise in the death rate from 10.8/1,000 in 1957 to 25.4/1,000 in 1960.[24]

To the question Li Choh-ming in his classic account of the statistical system of the PRC asks of whether the "reaffirmation of local party committee domination [of statistical work] led to a further deterioration of national statistics in 1959 and after, Sun's observations give an unmistakble "yes."[25] Other signs of deterioration in national statistics after 1959 include the cessation of articles on proportional development of the national economy[26] and suspension of work on national income.[27]

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[22] Li Choh-ming, "The Statistical System of Communist China," Berkeley and Los Angeles, 1962, pp. 79–82 and 116–121.

[23] SSB, "Statistical Work in New China," [Beijing], November 1979, p. 1.

[24] Article on strengthening statistical work and reforming the statistical system by Sun Yefang, Jingji guanli (Economic management), No. 2, Feb. 15, 1981, p. 3.

[25] Li Choh-ming, op. cit., p. 116.

[26] In a reprint of articles on proportional development of the economy, the most recent is an article by Xu Dixin originally published in the November 1962 issue of *Hongqi* (Red Flag). For this, see "Guanyu youjihua an bili gaosudu fajan guomin jingji lun wen xuan (A collection of articles on planned, proportionate, high speed development of the national economy), compiled by Shehui kexue yuan jingji yanjiu suo xueshu zilao, shi (The Academy of Social Sciences, Economic Research institute, Scholarly Data Section), Beijing, Zhongguo cai jeng jingji chubanshe, 1978, pp. 85–94.

[27] In his "Lun zonghe pingheng" (On comprehensive balances), Jingji yanjiu (Economic research), no. 11, Nov. 17, 1962, p. 11, Yang Yingjie speaks of national income and related compilations as work that was no longer being done when he was writing.

An attempt to revive and reform statistical work began in 1962 and continued for several years through 1965.[28] However, this work came to an abrupt end with the outbreak of the Cultural Revolution in 1966.

According to Sun Yefang,

> In the next 10 years [that is from 1966 to 1975] statistical organizations throughout the country were almost completely disbanded,[29] personnel dispersed, and large amounts of statistical data burned. Statistical work throughout the country was almost completely suspended for three years and even today is still only a shadow of its former self. At present, the staffs of statistical departments at the xian level and above [throughout the country] are only 76 percent of their 1965 strength and that of the SSB is not half as large as it was 1965.[30] Many municipal and xian statistical bureaus still have not been reopened and there are some xian where there are only two or three people responsible for the statistical work of the [whole] xian, and in many rural people's communes there is not one professional responsible for statistical work. Thus, there are very difficult problems that in varying degrees remain unsolved concerning accuracy of figures, incomplete data, unsound statistical methods, low levels of statistical analysis, and statistical data that are inadequate to meet the needs of national leadership and economic administration.[31]

Beyond the walls of government statistical offices conditions were no better. According to a People's Daily editorial near the end of 1979, although there were more than twice as many industrial enterprises in 1979 as before the Cultural Revolution, there were only half as many statistical workers throughout the economy.[32]

An account of a conference on occupations held in late August in Beijing under the auspices of the China Population Association (Zhongguo renkou xuehui) reveals a good deal about the origins, limitations, and rudimentary state of employment data at present in China.[33] Defective classification of employed persons had led to serious misunderstandings of employment problems. Employment is not divided on the basis of agricultural and nonagricultural work but on the basis of "whether or not a person eats commercial grain," i.e., is registered as eligible for grain rations in urban areas. Accurate estimates of agricultural labor do not exist. A question on occupations scheduled to be included on the 1982 population census form should provide the first comprehensive data on this subject in the history of China. Measurement of unemployment at present is inconsistent and varies from place to place.

Sun Yefang makes the following comments on statistical workers:

> In the past during periods of criticism many statistical workers have been criticized as "rightists" and labeled "rightist opportunists" and "anti-Party elements," because they reported actual conditions and exposed corruption. Such people still today have fearful memories [of those times]. When they write analytical reports, most of them are very self-conscious and generally report only good news but do not dare to report truthfully. Because of this, for 10 cata-

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[28] The titles of several official pronouncements aimed at reforming statistical work are given in SSB, "Statistical Work in New China," p. 1. In his comments on statistical work up to 1965 Sun Yefang, loc. cit., cites improvements in statistical methods, greater accuracy in statistics, and more timely reports as consequences of this attempt to reform statistical work.

[29] E.g., the Tongji chubanshe (Statistical publishing house) was shut down, according to a statement made by an official of the SSB in conversation with U.S. Bureau of the Census personnel. The staff of the SSB was reduced to 14 persons, according to Colina MacDougal, *The Financial Times* (London), last page of Section III, December 14, 1981.

[30] In 1965 the staff of the SSB included 193 persons, according to Sun Yefang, op. cit., p. 5.

[31] Sun Yefang, loc. cit.

[32] RMRB, Dec. 7, 1979, pp. 1 and 4.

[33] News item by Wang Shengchuan, RMRB, Oct. 3, 1981, p. 5.

> strophic years when the economy was on the brink of collapse there was no overall systematic reflection of this in statistics. Because conditions were unclear, many leaders could not see the severity of the dislocations in the national economy and in 1978 there was a "foreign leap forward."[34] Down to the present, we are still eating crow and it does not taste good.
>
> It appears that in our Party and country many people still do not clearly understand the serious mistakes caused by making big decisions before they fully understand what they are doing. Many places, departments, and organizations still do not give sufficient recognition to the importance of statistics. . . . In statistical departments there are many comrades who have been conscientiously trying to do a good job. But often their work is neither considered important nor supported by their superiors. Because of this many statistical workers are not happy in statistical work. For this reason, although four years have passed since the "gang of four" was smashed, statistical work is still defective and far from able to meet the needs of modernization.[35]

To sum up, from Sun Yefang's account, partially translated above, the decade from 1966 to 1975 was a disaster for statistical work, as it was for work in almost all professional fields. From this account and the discussion that follows the conclusion is inescapable that for 10 years (1966–1975) China was virtually without a central statistical system. In addition, Sun does not share the official view that since the downfall of "gang of four" statistics have been restored and strengthened.[36]

One consequence of the lapse in statistical work in the decade before the death of Mao Zedong is that discontinuities have been introduced into some statistical time series that make it virtually impossible to compare the 1950's with the 1970's. For example, the number of urban places in China, as the SSB classifies them, has dropped from nearly 5,600 in the 1950's [37] to about 3,400,[38] or 2,500 [39] depending on what source one uses. What is most important to note here is that the present system of population registration is incapable of generating urban and rural population figures comparable to those published by the SSB for the 1950's.[40]

The SSB appears to be aware of the need for comparability of data for the 1950's, 1960's, and 1970's, and has revised data on workers and employees and employment in agriculture. But this work is far from complete, as employment figures the SSB provided the Zhongguo jingji nianjian 1981 (Annual Economic Report of China 1981) show (see table 3).

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[34] This is a literal translation of the phrase yang yaojin and seems to refer to the official hopes current in 1978 that large-scale importation of complete foreign plants and utilization of foreign technology in large construction projects could lead to early modernization of the country.

[35] Sun Yefang, op. cit., pp. 3–4.

[36] For the official view, see SSB, "Statistical Work in New China," p. 1.

[37] Morris B. Ullman, "Cities of Mainland China: 1953 and 1958," U.S. Bureau of the Census, International Population Reports, series P–95, No. 59, Washington, D.C., 1966, table C, p. 8.

[38] For this, see Xinhua, Mar. 14, 1980 (FBIS, Mar. 14, 1980) cited in Leo Orleans' chapter in this volume, "China's Urban Population: Concepts, Conglomerations, and Concerns." Numbers of cities by various size classes that add to 3,400 are also given in an article on city construction by Bao Guangqian in Jiefang ribao (Liberation daily) Shanghai, Sept. 5, 1979, p. 3 and in another article on the same subject by Chen Weibang in Jingji yanjiu (Economic research), no. 11, No. 20, 1979.

[39] According to one SSB listing, there were 203 cities recognized as such by the State Council, and 2,300 county towns in 1980.

[40] The subject of discontinuity in urban and rural population data is discussed in Leo Orleans, loc. cit., and in Judith Banister, "China's Pattern of Population Growth," Stanford University Press, forthcoming, chapter 8, "Population Distribution and Internal Migration." Urban and rural population data for the years 1949–1956 are given in TJGZ, no. 11, June 14, 1957, pp. 24–25, translated in American Consulate General, Hong Kong, Extracts From China Mainland Magazines, no. 91, July 22, 1957, pp. 22–25.

C. Educational Policy and the Labor Force

Since 1949 educational policy in China has been subordinated to requirements of the Party and of the economy, as Party leaders have perceived them. The country's educational systems were expanded enormously, primary and higher education through 1960, and middle schools from 1970 to the present. As a consequence, in the last 20 years most children of school age, ages 7–14, have attended at least some years of primary school, while the great majority have attained minimum literacy levels. Since 1970 middle school enrollments, especially those of general middle schools, have grown sharply, providing a rapidly increasing proportion of the urban population aged 7–18 with secondary education. However, the proportion of the population that has any access to higher education remains tiny. There is little likelihood that this group will grow much in the near future.

Like industry, education in China has undergone several major reorganizations since 1949, all of which reflected changes in the "general line" and increasing politicization of education until the downfall of the "gang of four" and rise of Deng Xiaoping in 1976. Of the shifts in educational policy the most extreme was the Great Proletarian Cultural Revolution, in which teachers throughout China became targets of factional students' attacks. Schools were closed during the years 1966–1969. Under these conditions progress in education has been very uneven, as the following summary of major changes in educational policy shows.

After the formal establishment of the PRC in October 1949, the first major objective of educational policy was to bring the hodgepodge of state, private, and foreign (mostly missionary) schools under Party and government control. This goal was achieved by the end of 1952, according to official claims. Large numbers of allegedly anticommunist teachers were purged; the remaining teachers were subjected to extensive "ideological remoulding." Expansion of primary education, remedial literacy training of semiliterate or illiterate cadres, and programs to eliminate illiteracy were among the principal short-term educational goals of these early years of the PRC.

During the First Five-Year Plan (FFYP) period (1953–1957), CCP committees gained nearly complete control of all higher educational institutions and middle schools, openly pitting themselves against "bourgeoise teachers." [41]

The "general line" included a provision for "learning from the advanced experience of the Soviet Union," which meant in practice copying verbatim syllabi, textbooks, and other educational conventions used in the Soviet Union.[42]

Enrollments in higher educational institutions and middle schools were increased much more than in the preceeding three-year period (1950–1952) [42a] to meet FFYP targets.[43] Increases in primary school enrollments continued but were relatively smaller than during the years 1950–1952.[44] Ever larger class enrollments produced ever larger number of literate Chinese with career aspirations, but job openings fell off sharply in 1957 at the end of the FFYP period. Thus, a gap between aspirations and the means of fulfilling them was created that has remained in existence to the present.

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[41] R. F. Price, "Education in Communist China," London, 1970, pp. 31–33. This work is hereafter cited as Price, 1970.

[42] Ibid., p. 34.

[42a] U.S. Department of Commerce, Bureau of Economic Analysis, "Administrative and Technical Manpower in the People's Republic of China," by John Philip Emerson, International Population Statistics Reports, series P–95, No. 72, Washington, D.C., 1973, table A–6, p. 95. This report is hereafter cited as Bureau of Economic Analysis, 1973.

[43] "Zhonghua renmia gonghoguo fanjan guomin diyige wunian fanjan jihua 1953–1957" (Officially translated "First Five-Year Plan for Development of the National Economy of the People's Republic of China in 1953–57)," Beijing, 1955, pp. 136–138. This report is hereafter cited as "First Five-Year Plan."

Partly because the number of jobseekers in urban areas was much larger than the number of nonagricultural job openings in 1957, and partly because the growth of industrialization was slow, as the CCP and especially its leader Chairman Mao perceived it, Mao launched the Big Leap Forward in 1958. The effects on education and nonagricultural employment were scarcely believable. There were enormous reported increases in student enrollments at all levels [45] and in the number of nonagricultural workers and employees.[46]

In debates over educational policy in 1958 between Reds (CCP members), led by Mao himself, and experts (bourgeois teachers), the former emerged victorious. Education was to be made available to all school age children, which necessitated increasing the number of schools in deprived areas.[47] Curricula were to be revised to make them closely related to the needs of production, that is they were to be made into production manuals. Finally, education was to instill in the minds of students political consciousness and the will to serve the masses.[48] The great increases in school enrollments at all levels (table 1) and in the number of schools (table 2) and the conversion of schools at all levels to part-study part-work institutions and factories into part-work part-study factories were expressions of this policy.

However, the policy was shortlived. Mao's dreams of substituting redundant labor for scarce capital and putting everyone to work, of China leaping into the modern world at one bound, overtaking other fraternal socialist states (in particular, the Soviet Union), and of using education to do away with the "three major differences" between urban and rural areas vanished, as the Big Leap Forward collapsed in the second half of 1959. The nightmare of famine became reality for hundreds of millions of Chinese as grain production plummeted 26.4 percent from 195.05 million metric tons in 1957 to 143.1 million metric tons in 1960,[48a] and school enrollments declined sharply, nearly 25 percent in primary schools and 35 percent in secondary schools (table 1). Those declines can be thought of as rough indicators of the proportion of Chinese households, mostly peasant, that could no longer afford to keep their children in school because of famine. In cities and towns the collapse of the Leap also dealt severe blows to the population as 20 million industrial workers were discharged.[49]

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[44] Bureau of Economic Analysis, 1973, loc. cit.

[45] Ibid.

[46] U.S. Department of Commerce, Bureau of the Census, "Nonagricultural Employment in Mainland China: 1949–1958," by John Philip Emerson, International Population Statistics Reports, series P–90, no. 21, Washington, D.C., 1965, table 1, p. 128. This report is hereafter cited as Bureau of the Census, 1965.

[47] Since 1949 rural schools in the PRC have been inferior to those in urban areas. During the FFYP period this disparity was maintained as a matter of policy by budgeting more per student in urban than in rural schools.

Partly because of this form of discrimination against peasants, a member of a family of nonworker-nonpeasant origins (i.e., of "the exploiting classes or petty bourgeoisie"), was 70 times more likely to gain admittance to a higher educational institution than a member of a rural family. For the 1955 data on which this estimate is based, see John Philip Emerson, "Manpower Training and Utilization of Specialized Cadres, 1949–68," in "The City in Communist China," John Wilson Lewis, ed., Stanford, 1971, p. 193. This chapter is hereafter cited as Emerson, 1971.

[48] John Gardner, "Educated Youth and Urban-Rural Inequalities, 1958–66," in "The City in Communist China," John Wilson Lewis, ed., Stanford, 1971, pp. 236–237.

[48a] A recent summary of these and other grain output figures for the 1950's and early 1960's is given in K. R. Walker, "Chinese Grain Production Statistics: A Comment on Kang Chao's Research Note," CQ, no. 82, June 1980, pp. 342–343.

TABLE 1.—SCHOOL ENROLLMENT, BY LEVEL OF SCHOOL: SELECTED YEARS, 1949–79 [1]

[In thousands as of start of school year, generally about Sept. 1; figures may not add to totals due to rounding]

Year	Total	Primary	Secondary [2]	Higher
1949	25,776	24,391	1,268	117
1952	54,446	51,110	3,145	191
1957	71,805	64,283	7,081	441
1958	99,050	86,400	11,990	660
1965	131,201	116,209	14,318	674
1975	196,810	150,941	45,368	501
1979	207,898	146,629	60,249	1,020

[1] Includes full-time student enrollments; does not include spare-time or part-time education enrollments.
[2] Includes specialized secondary education and worker-peasant middle school enrollments.

Source: Except for 1958, data as supplied by the SSB to "Zhongguo jingji niannian 1981", ("Annual Economic Report of China 1981"), Xue Muqiao, Ma Hong, and Chen Xian, eds., Beijing, 1981, pp. VI–26. For 1958, data from Bureau of Economic Analysis, 1973, table A–6, p. 95.

TABLE 2.—NUMBER OF SCHOOLS, BY LEVEL OF SCHOOL: SELECTED YEARS, 1949–79

[In thousands]

Year	Primary	Secondary	Higher
1949	347	5.2	0.205
1952	527	6.1	.201
1957	547	12.5	.229
1958	936	28.9	.791
1965	682	14.4	.434
1979	924	147.3	.633

Source: Bureau of Economic Analysis, 1973, table A–5, p. 94 and Ministry of Education.

The next few years up to the start of the Cultural Revolution in 1966 witnessed a gradual recovery from the worst of these conditions. The level of grain production in 1965 was about the same as that in 1957.[50] Primary and middle school enrollments had recovered to and exceeded 1957 levels (table 1).

In the following decade, 1966–1975, the Cultural Revolution began with three chaotic years in which Red Guards terrorized most professional personnel, especially teachers, and followed this with more than five years of experimentation in admitting students to higher educational institutions on basis of political reliability, activsm, and class status. Sons and daughters of worker-peasant orgins with unblemished political records were preferred as candidates for admission. Academic achievement counted for next to nothing, and entrance examinations in academic subjects were not given. The only written examinations given to students enrolled in higher educational institutions at this time were final examinations given to groups of students. According to all reports that have appeared in the press since the death of Mao and the arrest of the "gang of four," this system failed to produce graduates with any academic qualifications whatever. Less is known about conditions in secondary and primary schools at this time, but there were reports of secondary school students unable to read or write.

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[49] Deng Xiaoping's speech of Jan. 16, 1980 at a national cadre convention in Beijing. Zhengming (Contention), Hong Kong, Mar. 1, 1980, translated in FBIS Mar. 19, 1980, Supplement, p. 28.
[50] See K. R. Walker, loc. cit.

Finally, in the years since the death of Mao old academic standards have been restored including written entrance and course examinations given to individual students. Enrollments have been maintained at near record high levels, producing more than 200 million students attending schools of all levels in each of the years 1976–1980. And for the first time since the founding of the PRC in 1949 Chinese students are being sent abroad in large numbers to study in Western countries.

D. Economic Policy

For the first 27 years of the PRC, economic policy underwent a series of radical revisions, most of which strongly reflected the thinking of Mao at the time they were made. All of them were designed to transform China from a pre-modern agricultural society into a modern industrial power in the shortest possible time. They varied from the capital intensive investment policy of developing heavy industry at the expense of the rest of the economy, known as the First Five-Year Plan (1953–1957), basically a copy of the Soviet First Five-Year Plan, to a labor intensive investment policy of developing everything overnight, known as the Big Leap Forward (1958–1960). Within three years of Big Leap policies of using human labor to replace capital it became clear that 18-hour work days were not enough. The economy had all but collapsed. China was on the verge of starvation.

To repair the economic damage done during the Big Leap Forward, the Party, in the early 1960's adopted two series of economic policy decisions. Known as the "Sixty" and "Seventy" Articles, these new policies governed agriculture and industry, respectively, and were designed to restore economic life to China by granting greater measures of autonomy and individual initiative to economic enterprises and managers than China had known in a decade. They were said to represent the views of Liu Shaochi, Chairman of the PRC, Vice-Chairman, CCP Central Committee, and the most powerful political figure in China after Mao Zedong.

Little has been published in China on the effect of these policy decisions on the economy. But from the few details that have appeared in print, both agriculture and industry by 1965 do seem to have recovered to 1957 output levels.[51]

At this juncture the ideological weight of Mao fell harder on China than it ever had before. As Mao started a nationwide purge called the Great Proletarian Cultural Revolution powered by bands of disaffected students known as Red Guards (hong weibing), the biggest political and social purge in China's history soon succeeded in erasing almost all of the post-Big Leap economic gains. As bands of Red Guards began attacking each other and fighting pitched battles in which hundreds were killed at one time, political and economic chaos reduced China to near civil war by 1967. From Liu Shaochi, one of the earliest and the most important victims of this purge, on down, few incumbent Party or government officials of any consequence or professionals of all types were immune to the ravages of these gangs of hoodlums. Millions were imprisoned and many were killed outright or died of injuries inflicted by Red Guards.

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[51] More 1965 statistics are contained in Zhongguojingji nianjian 1981 (Annual Economic Report of China 1981), Xue Muqiao, Ma Hong, and Chen Xian, eds., Beijing, 1981, than in any other published volume that has reached Western countries.

In 1968 the People's Liberation Army (PLA) was called out and assumed a large measure of the political power formerly exercised by by civilian leaders. Most of these by this time were in labor reform camps or some other form of detention. By the start of the 1970's the purge had nearly destroyed the Party as a functioning political organization. The PLA was all that was left to hold China together as a political entity. Revolutionary committees, as they were known, were formed to replace the now defunct provincial government councils and Party committees. More often than not a ranking regional military commander headed a provincial revolutionary committee. Under these conditions economic policy consisted of little more than day-to-day ad hoc decisions. Through the first half of the 1970's the economy drifted without any policy direction from the top leadership under Mao.

Not until Mao's death in 1976 and the resumption of power by the twice discredited Deng Xiaoping, did a group of top political leaders emerge who were able to make economic policy statements that gave some promise of economic recovery. They discarded Mao's economic thought as expeditiously as possible. The economic goals they announced in 1978 to modernize the economy in 10 years, however, proved to be far beyond China's resources to realize. These have been drastically scaled down and a set of proposed economic adjustments and reforms adopted at least on paper. The goal of all of these measures is modernization of the economy by the year 2000. At present there is no way of forecasting the extent to which they will succeed.

E. Jobs in China

Since completion of the land reform and collectivization of agriculture and traditional trades and socialization of the modern sectors of industry, construction, transport, trade, and finance in the 1950's, employed Chinese have worked in either one or the other of two basic types of enterprise or organization, one a collective undertaking and the other a state-run organization. Upwards of 90 percent of the population of China work in (and are members of) collectives, which are predominantly (although not exclusively) rural, while the remainder work in state-run undertakings, most of which are located in urban areas. Collectives are responsible for their own profits and losses and, in general, are not eligible for investment made under the state plan or for any other form of state cash distributions, except for disaster aid. State-run undertakings, on the other hand, receive state subsidies, as needed, and investment made under state economic plans.

From the standpoint of an employee the most important difference between the two types of organization lies in the form of compensation for work done. Working members of collectives receive shares of the net income of the collective based on the amount of net income, the number of working members, and the amount of work credited to individual members of the collective. Few fringe benefits (social services) are available in collectives. Collective members generally pay for whatever benefits (e.g., medical insurance) they receive.

Employees of state-run organizations, on the other hand, are paid fixed wages based in theory on the length of service, experience, skills, and responsibilities of the employee. Custom and regulation decree that a worker once hired cannot be fired except for the grossest violation of law or custom. As early as 1959 (and probably much earlier) workers often called such employment an "iron rice bowl" (tie fanwan),[52] that is a completely secure job, in this case for life. This expression is still in common use today to describe the same system.[53] In addition, workers are eligible for various benefits and services, such as maternity, sickness, and other disability leave, dormitory and other forms of housing, and have access to nurseries, kindergartens, libraries, and social clubs. They are also eligible for retirement and death benefits.[54] In urban areas workers and employees can count on dependable public transportation, running water, moving picture theaters, and other amenities of urban life, and much better primary and middle schools than are found in rural districts.

The great difference in the size of per capita state subsidies in the two main sectors of the economy, socialist and collective, in China today seems to explain why the leadership of the PRC has consistently opposed larger-scale urbanization for the most of the last 25 years. The state sector, accounting for less than 20 percent of the population, primarily urban and nonagricultural, receives almost all of the investment made under the state economic plans and almost all of the subsidized welfare and educational services and entertainment that the state provides, and is fed on what amounts to state-subsidized rations of grain, edible oil, meat, and fish purchased from the rural peasant population usually at fixed prices set by the state. On the other hand, the more than 80 percent of the population, mostly peasants, that provides most of the labor used to produce the food consumed in China receives very little in return—small amounts of cloth and other rationed items but very few social and welfare services. This situation can be viewed in several ways. One way is to think of it as most of the peasant population supporting the favored few in the cities. Another is to consider the two sectors as two separate economies which have very few interconnections. Either way, it is perfectly clear that it costs the state much more to support one city dweller eligible for state grain and other rations than to maintain one peasant at a subsistence level of living.

Differences between urban and rural standards of living have preoccupied Party leaders ever since the completion of collectivization and socialization programs in 1956–1957.[55] The differences are evidently great in most parts of China. Over the last 30 years since the founding of the PRC, they have led to ever more stringent controls on rural to urban migration, so that at present it is extremely difficult for a worker or employee from a family registered in a rural village to be considered a permanent urban resident no matter how long the person has worked in the city.[56] It appears that household registration now, as never before, determines what kind of education, what kinds of job and career opportunities, and even what retirement choices are open to individuals.

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[52] Article on the contract labor system by Li Yue, Jihua yu tongji (Plans and statistics), No. 9, June 23, 1959, p. 20.

[53] See, for example, the commentator's piece on collectives in RMRB, July 30, 1979, p. 1.

[54] For a recent listing of labor insurance benefits, see China Reconstructs, vol. 30, no. 5, March 1981, p. 19.

[55] An early example of the preoccupation of a top Party leader with problems of differences in urban and rural standards of living is a report by Tan Zhenlin entitled "Guanyu woguo nongmin shouru chingkuang ho shenghuo shuipingli chubu yanjiu" (Preliminary research on the incomes and level of living of peasants in our country), RMRB, May 5, 1957, reprinted in Xinhua banyuekan (New China semi-monthly) (hereafter XHBYK, no. 11, June 10, 1957, pp. 105–111; translated in American Consulate General, Hong Kong, Survey of China Mainland Press (hereafter cited as SCMP), no. 1555, June 21, 1957, pp. 25–30.

F. Roles of Labor in Society

There are two aspects of employment, one economic and the other social, that often seem to be in conflict or to contradict each other. One is labor viewed as an economic input which contributes to an economic output. The other is labor seen as a collection of people for whom it is generally agreed that society must provide minimum levels of welfare (including employment). Leading officials of the PRC have been and are acutely aware of the welfare claims of labor upon the resources of the economy. In fact, welfare aspects of employment are generally among the most basic considerations of any policy decision that affects the people of China as a whole.

For example, from at least as early as 1956 Party leaders have assumed responsibility for providing Chinese school leavers with some form of employment at as little cost to the state as possible. The great majority of those who leave school are graduates of primary schools, and the great majority of these graduate from rural primary schools. Although these school leavers, mostly peasants, make up by far the largest share of all those who leave school, they do not constitute welfare problems for the Party or government or anyone else except the households to which they belong and return as working members.

Often including members of three generations, the family has been from time immemorial and remains the basic social and economic unit in rural China. According to the authors of a recent study of village life in China,

> The family as a corporate economic unit, generally headed by a male, remain[s] the basic building block of rural life, and ke[eps] many of its old functions (support of the aged, early child care, the organization and consumption of domestic work, animal raising, and provision of housing), even as it los[ses] parts of other functions (the organization of daily farm labor, later socialization of the young).[57]

Although few in number compared to their rural counterparts, many of the school leavers who are members of urban households do constitute actual welfare problems, at least in the eyes of the Party, since there are few modern institutions that automatically channel into gainful employment the youth of China's cities and towns. The few such institutions that do exist, the "substitution system" (dingti zhi), for example (see below under III, A, 1, b), by their novelty call attention to the general lack of such practices.

Other exceptions do exist, however, in traditional segments of urban society. Among handicraftsmen, carters, and boat people, school leavers who choose to follow family trades become working members of the corporate households to which they belong, and thus acquire stable livelihoods.

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[56] See, for example, the editor's query on retired workers remaining in cities rather than returning to their native villages and the company's answer in Beijing ribao (Beijing daily), Apr. 4, 1981, p. 3.

[57] William L. Parish and Martin King Whyte, "Village and Family in Contemporary China," Chicago and London, 1979, p. 321. This study is cited hereafter as Parish and Whyte, 1979.

However, in most years since 1956 there have not been enough jobs in urban areas for the total number of new job seekers who appear on the labor market at the end of the school year. Party leaders have generally considered this disparity between job openings and job seekers as constituting a serious problem in Chinese cities.[58] Difficulties in finding jobs for new entrants to the labor market are not, of course, unique to China.

What is unique in the case of China is the Party's response to the problems posed by jobseekers among urban youth. Youth have been for years the prime target for Party indoctrination in the ideology of Mao Zedong. The assumption is that, once indoctrinated, the youth will take an active part in Party affairs, as in fact, the most ambitious often do. Party leaders consider such participation vital to the life of the Party. Under these conditions the Party has generally been unwilling to tolerate visible evidence of unemployment or at times even to admit the existence of unemployment among urban youth.

Of the several ways of eliminating employment among youth that the Party has adopted over the years, the best known and most widely used method has been to remove jobless youth from urban areas. This was done by "sending them up to the mountains and down to the villages" (shangshan xiaxiang).[59] Mountain areas traditionally have been among the poorest in China, and life there is very hard. Villages in this context mean peasant villages where more than 80 percent of all Chinese live.

From the beginning this program has been universally unpopular—unpopular with youth sent down who for an indefinite period were thus deprived of any chance of beginning a career in nonagricultural work, unpopular with parents who do not want their sons and daughters taken from them by the state and transformed into peasants, and unpopular with the peasants to whom the youth are sent, since the peasants regard the youth as additional mouths to be fed that the state has foisted on them. In fact, if the youth, totally inexperienced in farming as they are, cannot produce as much food as they eat, everyone receives a smaller share of the available supply of food, which is often inadequate to begin with. Evaluation of the success of this program of rustication, as it is sometimes called, depends to a large extent on the prejudices of the viewer. However, it is worth noting that in the last few years many, probably millions of the tens of millions of youth sent to the countryside, have made their way back to the cities from which they had been sent under circumstances that have forced many of them to live an illegal, underground existence.[60] Those who returned in this way clearly voted with their feet.

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[58] The views of some leading Chinese officials on the need to match the number of new entrants to the labor force with jobs are summarized in John Philip Emerson, "Chinese Communist Party Views on Labor Utilization Before and After 1958," Current Scene, vol. 1, no. 30, Apr. 20, 1962.

[59] A detailed account of this way of removing jobless school leavers in urban areas is given in Thomas P. Bernstein, "Up to the Mountains and Down to the Villages," New Haven, Yale University Press, 1977, 371 pp.

[60] In "Back to the City: The Return of Shanghai's Educated Youth," CQ, No. 84, December 1980, pp. 755–770, the author, Thomas B. Gold, gives a summary of the tumultuous, unplanned return to Shanghai of hundreds of thousands of Shanghai youth in 1979, based on his own observations in Shanghai and those of other witnesses and participants, Chinese and foreign.

Former Red Guards (of the Cultural Revolution) make up the largest identifiable group of youth sent from cities to rural areas. They not only lost their chance for extended formal education with the closing of schools at all levels at the start of the Cultural Revolution but also the chance to start careers in cities following their exile to rural areas with the disbanding of the Red Guards in 1968. They are reported to be full of resentment at the way they have been treated by the Party and state since the end of the Cultural Revolution. Some Chinese officials recognize the plight of these people, many of them not so young any more, and call them "the lost generation."[61]

The unpopularity of the transfer of large numbers of urban youth from cities to farms was probably the most important and perhaps the sole reason that the top Party leadership in 1978 decided to stop such transfers.[62] But a year later in the fall of 1979, the same leadership reconsidered the matter and decided to resume transfers of city youth on at least a limited scale.[63] One of the reasons for the about face in CCP policy towards urban youths may have been a consensus among Party leaders that it would not be possible for a second year in a row to give urban jobs to 8 million person, as was reported done in 1979, according to a recent report.[64]

II. LABOR

A. Total Labor Force

The labor force of China grew from 238 million persons in 1957 to 406 million persons in 1979, according to SSB estimates (table 3), or by 71 percent or an average annual rate of nearly 2.5 percent. Employment in nonagricultural branches of the economy grew to 94 million in 1979 from 40 million in 1957 (table 4). This increase of 54 million accounts for 32 percent of the growth of the labor force during these years. It represents an annual average rate of growth of 4.5 percent. As a share of the labor force nonagricultural employment rose from 17 percent in 1957 to 23 percent in 1979 (table 3). The agricultural force grew from 193 million persons in 1957 to 299 million in 1979, an increase of 55 percent or an annual average rate of 2.1 percent (table 3), according to SSB estimates. This absolute increase is substantially less than the net additions to persons in the working ages in rural areas (men 16–60, women 16–55), according to definitions used by the SSB.[65] However, it is 10 million larger than an estimate made by Thomas Rawski,[66] and extended on a pro rata basis to cover the last four years of the 22-year period, 1957–1979. The implications of this increase are discussed below.

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[61] The total number of youth reported transferred to rural areas varies considerably, according to the date of the report which gives the total. A total of 12 million was published at the end of 1975 and another of 14 million in the fall of 1976. For the sources of these figures, see Bernstein, op. cit., p. 31. A more recent source gives a total of 17 million for the years 1966–1976. For this, see Feng Lanrui and Zhao Lukuan, article on employment problems in China, Zhongguo shehui kexue (Social sciences in China), no. 6, November 1981, p. 191.

[62] Gold, op. cit., pp. 755–757.

[63] Ibid. pp. 767–768.

[64] For this figure, see Li Renju's report on plan fulfillment results in 1979, summarized in Nanfang ribao (Southern daily), Apr. 4, 1980, p. 4. During the four-year period, 1977–1980, about 28 million youth and others awaiting employment were placed in jobs. For this, see Chen Xian's article in Tongji (Statistics), no. 1, Apr. 10, 1981, p. 8.

[65] Definitions given in Bureau of the Census, "Estimates and Projections of the Population of Mainland China," by John S. Aird, International Population Reports, Series P–91, no. 17, Washington, D.C., 1968, p. 67.

[66] Thomas Rawski, "Economic Growth and Employment in China," New York, 1979, p. 39.

TABLE 3. –LABOR FORCE, BY SECTOR AND BRANCH OF THE ECONOMY: SELECTED YEARS, 1952–79

[Figures are in thousands and are yearend; components may not add to totals due to rounding]

Sector and branch	1952	1957	1965	1970	1975	1979
Total	207, 290	237, 710	286, 700	344, 320	381, 680	405, 810
Rural commune labor	182, 430	205, 660	235, 340	281, 200	299, 460	305, 820
Of which agriculture	(173, 170)	(193, 100)	(233, 980)	(276, 140)		(299, 340)
Workers and employees	24, 860	32, 050	51, 356	62, 160	81, 980	99, 990
Material production branches of the economy	19, 269	24, 903	40, 531			81, 907
Industry	2, 464	13, 480	17, 434			44, 367
Building trades	1, 048	2, 714	4, 765			8, 903
State farms, forestry, water conservancy, and meterology	239	1, 123	4, 943			8, 620
Transport, posts, and telecommunications	1, 129	1, 665	4, 176			6, 725
Trade, food and drink industry, and services	2, 923	4, 887	7, 503			12, 872
Urban self-employed	1, 466	1, 040	1, 710			320
Nonproductive branches of the economy	5, 592	7, 141	10, 825			18, 075
Science and technology, cultural affairs, education, and public health	2, 392	3, 273	6, 508			11, 310
Urban public utilities	41	218	440			1, 109
Finance	344	362	360			504
Government administration and mass organizations	2, 585	2, 870	2, 933			4, 680
Other	230	418	584			472
	Percent distribution					
Total	100. 0	100. 0	100. 0			100. 0
Rural commune labor	88. 0	86. 5	82. 1			75. 4
Of which agriculture	(83. 5)	(81. 2)	(81. 6)			(73. 8)
Workers and employees	12. 0	13. 5	17. 9			24. 6
Material production branches of the economy	9. 3	10. 5	14. 1			20. 2
Industry	6. 0	5. 7	6. 1			10. 9
Building trades	. 5	1. 1	1. 7			2. 2
State farms, forestry, water conservancy, and meterology	. 1	. 5	1. 7			2. 1
Transport, posts, and telecommunications	. 5	. 7	1. 5			1. 7
Trade, food and drink industry, and services	1. 4	2. 1	2. 6			12. 9
Urban self-employed	. 7	. 4	. 6			3. 2
Nonproductive branches of the economy	2. 7	3. 0	3. 8			4. 4
Science and technology, cultural affairs, education, and public health	1. 1	1. 4	2. 3			2. 8
Urban public utilities	(1)	. 1	. 2			. 3
Finance	. 2	. 1	. 1			. 1
Government administration and mass organizations	1. 3	1. 2	1. 0			1. 2
Other	. 1	. 2	. 2			. 1

[1] Negligible percent.

Source: Table 3 is based on data in "The Growth of the Chinese Labor Force: 1952–1980," table 1, Labor Force by Sector and Branch of the Economy: Selected Years, 1952–79. This is a forthcoming publication in the Bureau of the Censu ' International Population Reports Series P–95.

Neither in agricultural nor in nonagricultural work would the employment increases estimated above have been possible without very large increases in the labor force participation of women. There were 24 million more women workers and employees in 1979 than in 1957. Women accounted for more than 40 percent of the increase of 58 million workers and employees. Women's share of the total number of workers and employees doubled, rising from about 17 percent in 1957 to 31 percent in 1979[67] and to 34 percent in 1980.[68]

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[67] The absolute number of women employed in nonagricultural work in 1957, 6.752.000 (given in John Philip Emerson, "Sex, Age, and Level of Skill of the Nonagricultural Labor Force of Mainland China" (hereafter cited as Sex, Age, and Level of Skill), Foreign Demographic Analysis Division, U.S. Bureau of the Census, n.p., 1965, p. 26), is roughly comparable to the 31 million reported for 1979 (in Deng Yingchao's speech in Zhongguo funu [Women of China], [hereafter cited as ZGFN], No. 2, Feb. 15, 1979, p. 15). Non-

This rising proportion of women in both agricultural and nonagricultural work might be called one of the most revolutionary developments in Chinese society in the twentieth century, as well as in the structure of the labor force. It represents a perception among the great majority of urban households of the need for at least two employed persons per household to provide adequate support for an average family of four persons.[69] This perception continues to the present. According to a former Vice-Minister of Labor, it takes the wages of two or three members of a family of five to support the family.[70]

A similar revolution has occurred in the structure of the agricultural work. Although peasant women in China have always done a great deal of farm work, raising chickens and hogs, for example, changes in methods of compensating women for field work, made since the collectivization of agriculture in the latter 1950's, probably constitute the most important of the incentives that have drawn more than 50 million women into full-time work in agriculture [71] and have led to great increases in the number of workdays women contribute,[72] as explained in detail below. At present women probably make up more than 40 percent of the agricultural labor force.[73] With such increases in the number of working women in China, a country where "idleness is not a characteristic of the people," as one old China hand once wryly put it, the labor force participation rates of both sexes must be among the highest in the world. One Chinese publication recently said that more than half of the urban population of China was working, claiming this as a world's record.

The very high rate of recruitment in recent years of urban women for full-time work, resulting in a labor force participation rate of more than 40 percent, represents a great advance over the mobilization of older, largely illiterate women to staff newly organized "street industrial enterprise" in 1959 and 1960.[74-75] This latest large-scale in-

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agricultural employment totalled 39,667,000 workers and employees in 1957 (Bureau of the Census, 1965, table 1, p. 128). In 1979 there were 99,670,000 workers and employees according to SSB, "Main Indicators, Development of the National Economy of the People's Republic of China (1949–1979)," Beijing, 1980, p. 8.

[68] There were 34 million women workers and employees in 1980, who comprised 34 percent of the total number of workers and employees in that year, according to Kang Keching, speech, ZGFN, No. 4, Apr. 15, 1981, p. 2.

[69] The dependency ratio per worker and employee (the ratio per employed person of dependents in a household) began to fall sharply as early as 1958 from 3.2 persons in 1957 to 2.9 persons in 1958. These figures are quoted in Ma Wenrui's article on improvements in workers' livelihood, Gongren ribao (Daily worker), Sept. 25, 1959, reprinted in XHBYK, no. 20 (166), Oct. 27, 1959, p. 51, and translated in American Consulate General, Hong Kong, Current Background (hereafter cited as CB), no. 606, Dec. 21, 1959, p. 30. By 1971 it had fallen to 1.9.

[70] Article by Liu Zijiu, HQ, no. 4, Feb. 16, 1980, p. 12.

[71] This is the order of magnitude of the increase in the number of women working in agriculture, given in Marina Thorborg, "Chinese Employment Policy in 1949–78 With Special Emphasis on Women in Rural Production," in Congress of the United States, Joint Economic Committee, "Chinese Economy Post-Mao," Washington, D.C., 1978 (hereafter cited as Thorborg, 1978), table 6, p. 585.

[72] Thorborg, 1978, pp. 587–596.

[73] Even if a low estimate of 116 million women working in agriculture in 1978 (a residual left after deducting an estimated 28 million women workers and employees from the estimated 144 million working women in China in 1978, based on International Labor Organization data cited in ZGFN, no. 4, Apr. 15, 1981, p. 3) is used, it is 40 percent of the estimated 289 million persons working in agriculture in 1975. In Thorborg, 1978, p. 585, higher estimates of 125 145 million women working in agriculture are given. These, of course, are substantially larger shares of 289 million. Whatever women's share of the agricultural labor force actually was in 1975, there is no doubt but that it has risen in the last six years.

[74-75] See Marina Thorborg, "Women in Nonagricultural Production in Post-Revolutionary China" (hereafter cited as Thorborg, 1980), dissertation written in partial fulfillment of the requirements for a Doctorate of Philosophy, University of Uppsala, [1980], pp. 51–58.

flux of women into the ranks of urban workers and employees necessarily depended in large measure on younger women, most of whom were literate and graduates of primary schools.

The essential role of women of childbearing ages in the economic support of their families seems to be a secure guarantee of the permanence of this restructuring of the labor force. Success of the government and Party policy of limiting family size to one or two children, although not yet assured, will make it easier for many women to take and keep full-time jobs.

The early and apparently widespread acceptance of family planning in urban areas as a means of reducing family size and the growth of population may have stemmed indirectly from the Party and government efforts to halt rural to urban migration. Since the latter half of the 1950's, it has been Party policy in most years to reduce the growth of urban population by banning migration from rural areas, especially in the largest metropoles, and returning to their native villages dependents who had migrated earlier. The first large scale drive to send back such dependents occurred in the latter part of 1955.[76]

Although the total number of outmigrants was not published, and perhaps not known, 700,000 were sent out from the two cities of Shanghai and Tianjin.[77] The total number must have been in the millions. In the three years of economic crisis that began with the collapse of the Big Leap Forward in 1959 more than 20 million people were expelled from cities and towns to rural areas, according to Vice Premier Deng Xiaoping.[78] This number presumably included many of the more than 10 million peasants who migrated to cities in 1958,[79] as well as many of the 20 million workers and employees who were reported to have been discharged during the collapse of the Leap.[80] The exodus continued into 1962.

There is, however, no basis for estimating its size.[81] In the same year reduction of the urban population was listed as the fourth of "10 urgent tasks" in a program of economic readjustment approved by a session of the National People's Congress in April 1962[82] and thus became public policy. Two years later, a reduction of the urban population from 130 to 110 million over an unspecified period was a subject of discussion in official circles.[83]

The net effect of this policy over the years since 1964 unquestionably has been a reduction in the size of the dependent population in urban areas. The success of the policy may have contributed to the popular acceptance of a normative family size smaller than that sanctioned by traditional values, and so led to the early acceptance of family planning in urban areas.

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[76] Editorial on returning nonproductive population of cities to rural areas, Guangming ribao (Clarte daily), Dec. 29, 1955, translated in SCMP, no. 1203, Jan. 4, 1956, p. 8.

[77] Data Section article on population, TJGZ, no. 11, June 14, 1957, p. 24.

[78] See Deng Xiaoping's speech of Jan. 16, 1980 at a national cadre conference in Beijing, Zhengming (Contention), Hong Kong, Mar. 1, 1980, translated in FBIS, no. 55, 19 Mar. 1980, supplement, p. 23.

[79] As reported in Li Zhihan, article on labor productivity, JHYTJ, Apr. 23, 1959, p. 18.

[80] This figure is given in an article on China's economic readjustments in Zhengming (Contention), Hong Kong, no. 19, May 1, 1979, translated in FBIS, no. 92, May 10, 1979, U1.

[81] Foreign correspondents in Beijing talked of 30 million or more people scheduled for deportation from cities in 1962, but the actual number expelled was probably much smaller. For the 30 million see Vasil Magdeski, "Great Migration From Chinese Cities," Politika, Belgrade, July 25, 1962.

[82] "Press Communique of the Third Session of the Second National People's Congress," New China News Agency-English, Apr. 16, 1962; in CB, no. 681, Apr. 18, 1962, p. 2.

[83] Anna Louise Strong, "Interview with Po I-po on Economic Readjustment," Dagong bao (The Impartial), Hong Kong, Jan. 15, 1964, translated in SCMP, no. 3152, Jan. 3, 1964, p. 7.

B. Agricultural Labor

The agricultural labor force of China consists of persons who work full-time in raising crops (including state farms), animal husbandry, pond fishing, forestry, water conservancy, and meteorology, that is, people who work in the production of plant and animal products and in rural activities that contribute directly to such production. It numbers about 300 million persons (table 3), is drawn from a peasant population of about 800 million, and has grown by about 55 percent in the last 25 years, or at an average annual growth rate of 2.1 percent.

Although agricultural management has undergone what many would call a series of revolutionary changes since 1949,[84] the basic agriculture planning unit has remained small enough that all of its members are neighbors and often kinfolk in the same village.[85] Members of neighboring and/or related households also frequently work side by side. Maintenance of basic work units along family and village lines tends to emphasize traditional habits and work patterns and to discourage change. Because of this reported changes in agricultural work practices may often be more in the nature of announced goals than actual practices.

One example is the virtually universal discrepancy in rural China between the slogan "equal pay for equal work" and the actual practice. Despite the slogan, Chinese peasant women are almost never paid as much as men, even though they may do more work.[86]

However, new ways of rewarding women for farm labor probably form the single most important incentive that has induced women to make great increases in the number of workdays they perform.[87] Since the mid-1950's women have been doing an increasing share of all farm work, because they earn work points for workdays credited to them in commune records [88] and contribute measurable increases to household income. Such work accounts for a high proportion of gains made in agricultural production, a fact overlooked by most writers on Chinese agriculture. Increases in the number of workdays performed by women are reported throughout China, in both the north where women traditionally did little field work and the south where for centuries women have worked in rice paddies. This distribution is here taken as evidence of the universal application of the work point system in China.

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[84] Changes in agricultural management are summarized in Frederick W. Crook, "The Commune System in the People's Republic of China, 1963–74," (hereafter cited as Crook, 1975) in Congress of the United States, Joint Economic Committee, "China: A Reassessment of the Economy," Washington, D.C., 1975, pp. 363–378.

[85] Following collectivization in the 1950's the size of the basic agricultural planning unit increased from 6–8 to 20–50 households by 1959, according to Thorborg, 1978, pp. 536–540.

[86] Thorborg, 1978, pp. 540–554.

[87] Thorborg, 1978, pp. 587–589.

[88] Although there are many local variations in the way work points are awarded, the following is given as a paradigm of the system. Commune members may earn a maximum of 10 work points per workday. Work points are awarded on the basis of an individual rating of so many work points per day for given tasks or time or a combination. In other words, an individual accumulates work points by multiplying the number of days worked by his or her daily work point rating. Some details of the system are given in Parish and Whyte, 1979, pp. 63–71, Thorborg, 1978, pp. 542–554, and Crook, 1975, pp. 400–402.

As noted above under "Total labor force," the agricultural labor force grew from 193 million persons in 1957 to 299 million in 1979 (table 3) at an annual average rate of 2.1 percent. The rate of growth jumped from 2.3 percent per annum during the years 1957–1965 to 3.5 percent p.a. during the next five years 1965–1970, and then dropped to 1.8 percent p.a., or nearly half that rate during the 10-year period, 1970–1979. In the last two years of this period, the rate of growth was less than one percent p.a., or one percent exactly for the two years taken together (table 5).

The new entrants to the labor force during these two years, it should be noted, consisted of age cohorts born during the worst of the food shortage that followed the collapse of the Big Leap Forward during the years 1959–1961. Some idea of the severity of the conditions of life during these three years may be gained from consideration of the fact that for China as a whole there was a net loss of population during these years as a consequence of the following marked changes in birth and death rates. The birth rate fell sharply and the death rate soared during these years,[89] partly as a result of the extremely adverse effects of famine or near famine conditions on pregnant women. Under these constraints, the age cohorts born during these years were smaller than in any year since 1949, and so contributed fewer new entrants to the labor force.

After the worst of the food crisis had passed, the birth rate quickly recovered, and had risen well above the 1957 level by 1962. Consequently the age cohorts born since then are much larger than those of the years 1959–1961 and will be contributing much larger numbers of new entrants to the labor force in the next few years.

1. Labor supply in rural communes

The supply of agricultural labor in China is perhaps most easily thought of as the sum of the able-bodied men aged 16–60 and women aged 16–50 [90] plus some of their children and some of their older relations outside these ages who are members of nearly 180 million peasant households.[91] Most of the able-bodied males work full-time and are counted as male labor force units in commune records of the production teams of which they are members. Only a small percentage of the adult population of communes hold full-time nonagricultural positions as commune administrators, accountants, and school teachers, or work full-time in commune industry, or are engaged in commune services.

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[89] The birth rate was reported to have been 34 per thousand in 1957 (Table 1 of Aird's chapter of this volume) and is estimated to have been 18 per thousand in 1961, according to John S. Aird, "Reconstruction of an Official Data Model of the Population of China," table 8, a paper delivered at the China Population Analysis Conference, May 19–23, 1980, the East-West Population Center, Honolulu, Hawaii. In his article on population problems, Zhu Zhengzhi reports that there were negative rates of growth in several years of the 1958–1961 period. For this, see Jingji kexue (Economic science), no. 3, 1980, pp. 54–58. In Jingji guanli (Economic management), no. 4, 1981, p. 3, Sun Yefang cites the death rate of 25.6 per thousand in 1960 as a disastrous consequence of the Big Leap Forward.

[90] These are the working ages for able-bodied men and women in China used as early as the collectivization of agriculture in 1956. For this, see Wang Guangwei's article on rural labor in Jihua jingji (Planned economy), no. 8, Aug. 9, 1957, pp. 6–9. See also Bureau of the Census, 1965, pp. 48 and 199–203. Although an official U.S. delegation to the SSB in 1979 was told that the age limits of working age years remained unchanged, there are indications that the upper limits have been raised five years to 65 for men and ten years to 60 for women. This is the definition of working ages used throughout an article on population and economic development in China by Zheng Zehou and Chen Yuguang in Zhongguo shehui kexue (Social sciences in China), no. 4, July 10, 1981, p. 30 and passim. The lower limit remains 16 years of age in this study and also in a study by Yu Wang in RKYJ, no. 2, April 1981, p. 8.

[91] This figure is an estimate based on the statement that 25 million households equal 14 percent of the country's rural households, or 179 million households in all. For this statement, see Xinhua in English, Beijing, 0824GMT, 25 March 1981 in FBIS, no. 25, 25 Mar. 1981, L5. For 1979, the number of households in rural communes is reported to have been 174,910,000 in Zhongguo jingji nianjian 1981 (Annual economic report of China 1981), Xue Muqiao, Ma Hong, and Chen Xian, eds., Beijing, 1981, pp. VI–9.

Able-bodied women who are members of production teams are counted as female labor force units. The number of days per year a woman spends in farm field work depends basically on how time consuming her household responsibilities are. The more burdensome these responsibilities are, the less likely she is to work fulltime as a production team member. Even so, a very high percentage of all peasant women—evidently more than 80 percent—do some field work and earn some work points.[92] As noted above, although "equal pay for equal work" has been a Party slogan for many years that implies a lack of sex bias in paying men and women, women are almost never awarded as many work points as men, no matter how much work they do.[93]

Other persons, male or female, beyond the ages listed here are counted in commune records as half (as opposed to full) labor force units and are awarded only a fraction of the work points given to persons counted as full labor force units. Today most of the underaged entrants to the agricultural labor force are school leavers. Most of them can read and write simple, everyday, spoken Chinese. Many are primary school graduates.[94]

The fact that the family continues to function as an economic unit in rural China probably explains to a large extent why every member of a peasant family feels an obligation to contribute to the family income. The listing of work points awarded to each working commune member multiplied by the number of labor days worked gives a permanent record of reach individual's contribution, and there are unquestionably strong incentives to make the contribution as large as possible.

However, there are many indications that in many localities willingness and ability to work is not necessarily a guarantee of income for peasant households, because such places have an oversupply of labor during much of the year, or have opportunities for more gainful employment elsewhere. For example, vegetable farming in the suburbs of Beijing is mainly the work of women whose husbands are employed in nonagricultural jobs outside the communes, working either as permanent or temporary workers and employees, or as contract workers. A rising proportion over time of household income derived from sideline occupations may also be a sign of the redundancy of farm field labor in the locality.

2. *Sectoral transfers*

Since the collapse of the Big Leap Forward in 1959 and 1960 there have been two kinds of sectoral transfers of manpower to rural areas. One includes city youth who "volunteered," usually in groups, for transfer to rural communes and state farms, to form a generation of "educated peasants" to quote a felicitous phrase widely used at the time. As noted above, there were probably fewer than 20 million urban youth in all who were "sent down" to rural villages, at most no more than about five percent of the agricultural labor force at any given time, and often much less. The contribution of urban youth to agricultral production was marginal at best, and may actually have been negative, that is the youth hindered farming operations. Some people have defended these transfers as a means of providing rural villages with skills they otherwise would have lacked, but there seems to be little substance to support this view.

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[92] Thorberg, 1978, 572–573 and 584, Rawski, 1979, p. 34.

[93] Thorborg, 1978, pp. 540–555.

[94] For more details on peasant youth joining the labor force, see Parish and Whyte, 1979, pp. 227–231.

A related manpower transfer to rural areas begun during the Cultural Revolution and sharply cut back after Deng Xiaoping returned to power for the second time in 1976 included cadres selected for "reeducation" in "May 7" schools. These were essentially labor reform camps set up near the start of the Cultural Revolution in 1966. They were generally located in rural areas and farming was their chief economic activity. Total enrollment in these schools probably did not exceed two million at any one time. The contribution they made to the agricultural economy probably consisted of no more than the food grains and vegetables raised to meet the minimum dietary requirements of the inmates.

The other major sectoral transfer included persons who had completed a period of military service and had been discharged and returned to their native villages. In most years more than 70 percent of the servicemen being demobilized are placed in agricultural work.[95] The total number of ex-servicemen returned to the agricultural sector of the economy in the last 30 years probably does not exceed 15 million,[96] but the importance of this group to agriculture almost certainly far exceeds what a head count would indicate. They are peasant males in the prime working ages, usually literate, disciplined, and often equipped with training and skills learned in the People's Liberation Army (PLA) that can be used in agriculture, for example, training and experience as motor mechanics, truck or tractor drivers, or electricians. These former servicemen, who are subject to recall to active duty in time of need, are generally recognized at the commune level as constituting a leadership group that possesses unique organizational as well as technical skills.[97]

Finally, there is the contribution members of the PLA on active duty make to agricultural production. In 1979, PLA members were reported to have contributed 14.32 million labor days to agriculture. This is the equivalent of about 40,000 man-years of able-bodied male peasant labor, or about 3/100ths of one percent of the total number of man-years spent on agriculture in 1979.[98] The number of labor days is well below the 20 million reported for 1957.[99] Diversion of PLA resources to agriculture and other sectors of the economy has always been frowned on by Chinese military leaders since the chief contribution made by PLA members is their time, which would otherwise be spent in training and education to upgrade the military effectiveness of the PLA.

3. Demand for labor in rural communes

As noted above, more than 100 million persons were added to the agricultural labor force between 1957 and 1979. According to the SSB estimates given in table 5, there were more than 300 million people in the years 1977–1979 classified as working in rural communes (not including employees of state enterprises in rural areas, such as schools, clinics, and hospitals). In the last two of these years this work force grew by only one percent (table 4).

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[95] Emerson, 1967, p. 432.

[96] According to Emerson, 1967, p. 432, 5 million discharged servicemen were placed in agricultural work in the first 10 years of the PRC. In the next 20 years it seems likely that fewer than 10 million were returned to their native villages.

[97] Parish and Whyte, 1978, pp. 110–111.

[98] The number of labor days the PLA contributed to agriculture is reported in Zhongguo baike nianjian 1980 (Chinese encyclopedic yearbook 1980), Hu Qiaomu et al., eds., Beijing, 1980, p. 254. This is consistent with a more recent report that in the last two and one half years (presumably through June 1981) the PLA contributed 42–68 million labor days to agriculture. For this, see Dazhong ribao, (Masses daily), July 31, 1981, p. 4.

[99] Emerson, 1967, p. 432.

TABLE 4.—NONAGRICULTURAL EMPLOYMENT IN THE PEOPLE'S REPUBLIC OF CHINA, BY BRANCH OF THE ECONOMY: 1957 AND 1977–79

[Absolute figures are yearend and in millions; percents may not add to totals due to rounding.]

Branch and sector	1957	1977	1978	1979
Total	34.97	85.02	88.89	93.77
State-owned units	23.99	65.37	68.41	71.03
Collectively owned units	10.98	19.16	20.48	22.74
Material production branches	27.62	----	68.01	----
Industry, of which	11.37	----	42.56	----
State-owned industrial units	17.91	----	30.41	----
Collectively owned industrial units	3.46	----	12.15	----
Street and other colle:tive industry		----	5.28	----
Except for urban handicrafts	3.46	----	6.87	----
Salt	.59	----	1.40	----
Fishing	1.59	----	1.20	----
Capital construction	2.17	----	7.00	----
Transport, posts, and telecommunications	4.26	----	7.45	----
Trade and the food and drink industry	7.82	----	11.00	----
Nonproductive branches	7.35	----	20.88	----
Finance, banking, and insurance	.62	----	.58	----
Services	.49	----	.32	----
Public health	.55	----	3.60	----
Education	2.54	----	9.36	----
Cultural affairs and scientific research	.12	----	1.23	----
Government administration and mass organizations	2.88	----	5.45	----
Urban public utilities	.13	----	.29	----
Meterology	.02	----	.03	----
	Percent distribution			
Total	100.00	100.00	100.00	100.00
State-owned units	68.60	77.46	76.96	75.75
Collectively owned units	31.40	22.54	23.04	24.25
Material production branches	78.98	----	76.51	----
Industry, of which	32.51	----	47.88	----
State-owned industrial units	22.62	----	34.21	----
Collectively owned industrial units	9.89	----	13.67	----
Street and other collective industry		----	5.94	----
Except for urban handicrafts	9.89	----	7.73	----
Salt	1.43	----	1.57	----
Fishing	4.29	----	1.35	----
Capital construction	6.21	----	7.87	----
Transport, posts, and telecommunications	12.18	----	8.38	----
Trade and the food and drink industry	22.36	----	12.37	----
Nonproductive branches	21.82	----	23.49	----
Finance, banking, and insurance	1.77	----	.65	----
Services	1.40	----	.36	----
Public health	1.55	----	4.05	----
Education	7.26	----	10.53	----
Cultural affairs and scientific affairs	.34	----	1.44	----
Government administration and mass organizations	8.24	----	6.13	----
Urban public utilities	.37	----	.33	----
Meterology	.06	----	.03	----

Source: Table 4 is based on data in "The Growth of the Chinese Labor Force: 1952–1980," table 2, Workers and Employees, by Branch of the Economy: 1957 and 1977–79. This is a forthcoming publication in the Bureau of the Census' International Population Reports, Series P-95.

(....) indicates data not available and no estimate made.

Nearly 90 percent of this work force was directly engaged in agricultural field work. More than nine percent of the labor force worked in commune industrial establishments, seasonally for the most part.

TABLE 5.—EMPLOYMENT BY SECTOR, 1977-79

[Figures are in millions and are yearend; components may not add to totals due to rounding]

Sector	1977	1978	1979
Employment, total	393.6	398.4	405.5
Rural commune labor	302.5	303.4	305.8
Workers and employees	91.1	95.0	99.7
Of whom, state enterprises	72.0	74.5	76.9
Urban collective enterprises	19.1	20.5	22.7

Source: "The Growth of the Chinese Labor Force: Selected Years, 1952-1980." This is a forthcoming publication in the Bureau of the Census International Population Reports, Series P-95.

Commune services including administration, entertainment, and the like were generally provided for in budgets of higher level administrative units—the county, for example—and for this reason personnel engaged in these activities were usually classified as workers and employees and not included as part of the agricultural labor force in SSB estimates. This group numbered only about one million in 1979, less than three-tenths of one percent of the agricultural work force, an indication of how rudimentary the services are that are available to members of rural communes. By comparison, city dwellers are provided with a wealth of services, although they appear spartan by Western standards. In the last few years these differences have not been lost on the Chinese, as they once again have begun to look closely at themselves and the lives they lead, and make comparisons with the rest of the world.

Thomas Rawski has made the most detailed analysis of labor absorption in China's agriculture that is currently available. Rawski concludes that,

> During the past two decades collectivization and industrialization have modified the framework of China's rural economy in directions that have permitted rural labor as well as land to be used with increasing intensity. Intensification of cropping practices and of the cropping cycle, increasing adoption of labor-using plant and animal products, and massive farmland construction campaigns have contributed to agricultural development by a simultaneous raising of output and absorption of rural labor.[100-103]

The mechanization of Chinese agriculture made possible by industralization has had an effect on the use of labor the opposite of what it had in the United States in the last century. To date, each form of mechanization, for example mechanized pumps replacing man- or animal-powered water wheels and similar devices used to raise water for irrigation, has required more and not less labor, since it makes possible more intensive use of existing cultivated land.

Chinese agriculture, labor intensive to begin with, resembles what we in the United States think of as gardening much more than it does what we call farming. In raising many crops in China each plant from seeding to harvesting is individually cultivated by hand.

[100-103] Rawski, 1979, p. 71.

Fertilizing and cultivating farm land require the largest labor inputs. Preparation and use of organic manure alone, that is collection, transport, storage, and application, consumes 30–40 percent of the man-years spent annually in agriculture.[103] The number of hogs, traditionally raised in China as fertilizer producing machines, virtually doubled between 1957 and 1975,[104] requiring twice as much labor at the end of the period as at the beginning. The resulting increased output of organic manure may be used to fertilize a second crop grown on newly irrigated land that is capable of supporting a second crop and requires at least one additional application of fertilizer.

More intensive land use has necessitated increasingly large inputs of labor to prepare land for spring plowing and cultivation. Such work is known as farmland capital construction. It is done for the most part in what is called the slack season between the end of the last harvest and the start of spring plowing and occupies all told less than two months. Since 1973 more than 100 million people have been engaged in this work each year, that is more than one-third of the agricultural labor force. The number has risen steadily since 1963 when there were only an estimated 8–15 million persons so engaged (table 6).

TABLE 6.—NUMBER OF PERSONS ENGAGED IN WINTER WATER CONSERVANCY CAMPAIGNS: 1958–1977

Year	Participants (millions of persons)	Year	Participants (millions of persons)
1958	150	1970	60–80
1963	8–15	1971	90
1964	15–30	1972	80–90
1965	30–40	1973	100
1966	40–60	1974	100
1967	40–60	1975	100
1968	30–45	1976	100
1969	50–60	1977	100

Source: Except for 1958, Thomas G. Rawski, "Economic Growth and Employment in China," Oxford University Press, (for the World Bank), 1979, p. 111. 1958: John Philip Emerson, "Sex, Age, and Level of Skill of the Nonagricultural Labor Force of Mainland China," n.p., Foreign Demographic Analysis Division, U.S. Bureau of the Census, June 1965 note 25.

What of the future? For how much longer will China's agriculture be able to absorb sizeable labor increments? As early as 1978 when Rawski was writing a report on industrialization, technology, and employment in China for the World Bank, he detected signs that labor productivity in agriculture fell by 17–24 percent between 1957 and 1975.[105] In the revision of this report published in 1979 as a book he referred to falling labor productivity and added estimates of falling total factor productivity as another sign of diminishing returns.[106] More recently, in a book on Chinese agriculture, Nicholas Lardy has concluded that for the 12 years from 1965–1976 collectively distributed income from agriculture was at best constant, that with increasing restrictions on individual households' cultivation of private plots and on engaging in private trade on their own account the privately derived share of total farm household income almost certainly fell, and that consequently total household income fell.[107] In the last few years, senior officials in the PRC have expressed concern about the widening gap between urban and rural incomes. To narrow the gap the state has since granted substantial increases in the prices of important commodities sold by rural communes and individual peasants. These price increases together with three good crop years (1977–1979) have led to income increases for most peasant households. In regard to the incomes of peasant households, the question that remains to be answered is whether there will continue to be sustained increases on a comparable scale in the incomes over the next decade. Rawski answers that this question is "inextricably linked with the fate of China's current drive to raise the annual growth rate of agricultural output from approximately 2.6 percent achieved between 1957 and 1974 [108] toward an unprecedented target level of between 4 and 5 percent between now (1978) and 1985." [109]

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[103] Rawski, 1979, p. 94.

[104] Ibid.

[105] Thomas G. Rawski. "Industrialization, Technology, and Employment in the People's Republic of China." World Bank Staff Working Paper, no. 291, Washington, D.C., August 1978, pp. 97, 101, and 102.

[106] Rawski, 1979, pp. 71 and 119–122.

Future growth of the agricultural labor force is equally hard to predict. Whether it will grow by 10 or 100 million through the 1980's will depend, according to Rawski,[110] on whether the historic nonagricultural employment growth rate of 5 percent is maintained or whether it rises to 7.5 percent. On the basis of available information there is no way of making a rational choice between these rates of growth or some intermediate rate.

III. NONAGRICULTURAL LABOR: 1957, AND 1977–79

A. Labor Supply in Urban Areas

1. Demographic aspects of labor supply

Increases in the labor supply in urban areas depend largely on four demographic factors, increases in the working age population from age cohorts entering the working ages (usually taken as 18 years in China), increased labor force participation rates among both sexes, but especially among women in China and other countries where tradition inhibits women from working outside the household, and finally in-migration, and out-migration. Although the last two forms of population movement were of great importance to the size and composition of the urban labor force through the disastrous aftermath of the Big Leap Forward in 1961, a strict ban on rural-to-urban migration since then has made them of negligible importance in recent years. In-migration can be discounted altogether. Out-migration has been limited largely to urban school leavers whom the Party sent in groups to rural areas to become educated peasants. As noted above, they numbered in all between 12–14 million. The chief importance of this group of transfers seems to lie in the number of aborted and ruined careers that the total number represents. Its chief effect on the urban labor force has been to expand several types of temporary labor, to allow urban women more opportunities for participation in the labor force, and indirectly, to give rise to a unique form of job inheritance.

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[107] Nicholas R. Lardy, op. cit., chap. 4.
[108] Rawski, 1979, p. 107.
[109] Ibid., p. 135.
[110] Ibid., loc. cit.

Temporary labor.—There are several forms of temporary labor in nonfarm enterprises that have been officially sanctioned for more than 20 years.[111] Like the transfers of youth from city to countryside, widespread use of temporary labor is a symptom of oversupply and underutilization of labor, particularly in agriculture. This is not a new phenomenon in China. In his classic work on Chinese agriculture John Lossing Buck estimated that in 1929–1933 only 35 percent of the able-bodied agricultural laborers surveyed worked full-time, 58 percent worked only part time and were idle part time, while the remainder did little work because of sickness.[112]

Still earlier, in the 1860's and 1870's, Chinese labor gangs under contract had been transported from Canton to California to build the Central Pacific Railroad from San Francisco to Utah.[113] These laborers numbered in the tens of thousands.

One Chinese claim in the first few years after the establishment of the PRC was that the baogong system (contract labor supplied by labor bosses mainly to construction enterprises) had been destroyed. This probably explains the sharp drop in the number of workers and employees in private construction enterprises from 150,000 in 1949 to 18,000 in 1952.[114]

Widespread use of contract peasant labor for nonagricultural work in urban areas deprives city youth of job opportunities on something less than a one-to-one basis, depending on the average length of a contract. For example, a three-month contract would mean that for every four peasants hired on contract one city youth would lose a chance for a job. From the start the contract labor system (hetong gong zhidu) was thought of as a way of avoiding hiring regular, that is, permanent workers and employees whose jobs even as early as 1959 were called "iron rice bowls," because such workers could not be laid off, even if they were not needed to meet production targets.[115]

The contract labor system originated soon after agricultural producer cooperatives became the standard form of organization of collectivized agriculture in 1956.[116] It consists of gangs of peasants hired out on contract to industrial and other enterprises for varying lengths of time.[117] The economic advantages to the contracting industrial establishment, the contracting cooperative, and the peasants under contract are obvious. The industrial enterprise hiring the peasants employs them only for as long as it needs them and pays them lower wages than it would pay regular workers and employees. The cooperative (now rural people's commune) takes a share, sometimes a very large share, of the wages the peasants earn under contract. The peasants under contract earn more, even after the cooperative takes its share, then they would working in the cooperative's fields and thus gain an increase in income. Top Chinese officials, however, have made no secret of the fact that they consider the contract labor system as basically undesirable.

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[111] See the articles on temporary labor cited in Bureau of the Census, 1965, p. 48, notes 66 and 67. It was taken for granted by Chen Zhihe in his articles on the statistical coverage of workers and employees in TJGZ, no. 1, Jan. 14, 1957, pp. 19–20 and JHYTJ, no. 9, June 23, 1959, pp. 20–22 (both articles translated in Bureau of the Census, 1965, pp. 193–199).

[112] John Lossing Buck, "Land Utilization in China," Chicago, 1937, p. 294.

[113] Stan Steiner, "Fusang: the Chinese Who Built America," New York, 1979, pp. 128–140.

[114] TJGZ, Data Section, "Woguo jianzhuye di jiben chingkuang" (The basic conditions in building trades of our country), TJGZ, no. 24, Dec. 29, 1956, p. 31.

[115] Li Yue, article on contract labor, JHYTJ, no. 9, June 23, 1959, p. 20.

[116] The system was first mentioned in a series of articles in RMRB June 7, 1958, translated in SCMP, no. 1795, June 19, 1988, pp. 25–29.

[117] Li Yue, loc. cit.

China exported some labor in the 1970's, notably engineers and laborers for the Tanzam Railway, completed in 1975, that runs 1,860 kilometers from Dar-es-Salaam through Tanzania and Gambia. In the summer of 1979 China and Italy signed an agreement under which Chinese labor would be supplied for use with advanced Italian technology in construction projects. Prior to the signing of the agreement, reports mentioned 400,000 as the number of technicians and workers that China was prepared to supply. Although the personnel to be supplied under this agreement presumably are not peasants, the agreement is symptomatic of a more than adequate supply of labor to meet China's present construction needs.

In tandem with the policy of transferring youth from city to countryside it has been Party's policy to try to enforce more strictly the prohibitions against rural to urban migration. These were designed to stem the flow of individual peasant migrants which swelled the population of China's cities and towns after the collectivization of agriculture in 1956 and after the start of the Big Leap Forward and formation of rural people's communes in 1958, when more than 10 million peasants migrated to cities in response to a great increase in the number of new jobs.[118-119] It was these prohibitions that give rise to the contract labor system, described above, which provided peasant labor as needed in urban areas but did not allow permanent migration.[120]

The "substitution system".—Workers are often called a privileged class in China by writers outside the country. One privilege enjoyed today by Chinese workers appears to be unique to China. A worker in a state-owend enterprise may now elect early retirement, so that a son or daughter can succeed the parent in occupying a position (not necessarily the one held by the parent) in the same enterprise. This is called the "substitution system" (dingti zhi).[121] It is also clearly a sign of labor in excess of demand in the most prestigious enterprises in China.

Although the "substitution system" is not universal, it apparently is widely used where it can be. For example, in one Tientsin textile mill with 4,500 workers and employees, 700 chose early retirement under this system in 1979,[122] or 16 percent of the work force. Native-born Chinese residing in the United States who have recently visited China report that some of their friends have retired in favor of sons and daughters. The overall effect of this system of early retirement is readily discernible in data on the number of people newly hired in 1979 and the increase in the number of workers and employees. As noted above, more than 8 million persons were given jobs in 1979,[123]

[118-119] Emerson, 1967, pp. 421–422.

[120] Ibid.

[121] Retirements in Peking in 1979 are described in a Xinhua release of 13 June 1979, of which the 14 June 1979 English translation is given in FBIS, 15 June 1975, R1. The "substitution system" is also described in brief in the part of "China in the 1980's," written by Emily MacFarquhar, The Economist, Dec. 29, 1979, pp. 22–23.

[122] Ibid.

[123] Li Renjun, loc. cit.

but the number of workers and employees increased by only 4.68 million (data in table 3). From these figures it appears that in addition to regular retirement and death, voluntary early retirement provided work posts for more than 3.32 million of the more than 8 million persons given jobs in 1979. The more than 3.32 million vacated work posts represent a 3.3 percent labor turnover in that year. As the nonagricultural work force in China ages, labor turnover caused by retirement and death can reasonably be expected to become an increasingly important source of new jobs.

Temporary workers and employers.—From 1949 to at least 1970 a group of urban dwellers existed who met the needs of industrial enterprises and other establishments for very short-term work. Known as linshi zhigong (temporary workers and employees), such people were in theory hired on a daily basis. They were not carried on the books of the enterprises as employed persons. Hence it appears they were not paid out of the wage fund, but probably from general administrative expenses or petty cash. They were not eligible for any of the benefits to which permanent workers and employees were entitled. Although nothing is available on the size of this group and very little has been written about them, they apparently were numerous, at least by the later 1960's. At that time their complaints about their second class status as workers and employees were loud enough to attract the attention of Premier Zhou Enlai. By 1970 this class of temporary employees were given the status of permanent workers and employees, even though they lacked the necessary job qualifications, according to refugees from China interviewed in Hong Kong. It seems likely that this marginal group on the fringes of the labor force consisted largely of illiterate women well along in years who hired themselves out for work of this kind because they could find or were qualified for nothing better.

2. The educational system as a source of urban labor

During the FFYP period and up to the collapse of the Big Leap Forward in 1960, the educational system never functioned successfully as a supplier of technically and professionally trained personnel to the Chinese economy, even though it was modelled on the Soviet system which was designed to do exactly that. The reasons for this marked failure are complex [124] and need not detain us here, since the system has long since ceased to be operative and never will again in its old form.

As noted above, many school leavers below the college level were routinely sent to rural areas to become educated (i.e. literate) peasants. Most of those sent down to the farm had left the middle school system. That this practice continued for the better part of two decades is an indication either that the economy of urban areas did not feel a pressing need for the services of this regular supply of employable youth or that mechanical defects in the system of employment and manpower allocation prevented utilization of this manpower stream. The actual explanation probably combines both elements in varying proportions depending on the year, if problems of employing urban youth encountered in the last few years are any guide. School leavers who became Red Guards during the Cultural Revolution probably meet strong resistance to any requests for employment they may make. As noted above, since 1977 more urban youth looking for work have been absorbed by the collective sector than by the state sector. Such job seekers have given much more freedom to find work on their own than they had previously as a consequence of a great relaxation of official regulations on hiring practices. To sum up, the experiences of youthful job seekers during the last 20 years indicate a labor supply from the educational system that chronically exceeds demand in urban areas.

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[124] Bureau of Economic Analysis, 1975, passim is an attempt to explain the PRC's failure to train and utilize technical and professional manpower.

3. Urban women as a source of labor

Urban women have become an increasingly important source of labor in nonagricultural branches of the economy between 1970 and 1979. The number of women employed in these branches rose from 10 million in 1957 [125] to 31 million in 1979.[126] Women's share of total nonagricultural employment rose from 17 percent in 1957 [127] to 31 percent in 1979 (table 7).

Although women "hold up half of heaven" (banbian tian), as the saying goes, and make up half of the society of New China, in the 1950's they were doing far less than half the work done to produce crops, manufactures, buildings and other construction, and social services, despite repeated efforts of the CCP to 'liberate women from the drudgery of housework," and bring them into the labor market. Such "liberation" was one of the announced aims of the Big Leap Forward, but one that at the time did not appear to have achieved any lasting results in urban areas. Even in 1958, only about 8 percent of the newly hired industrial workers and employees were women.[128] In the same year, in which nonagricultural employment jumped 43 percent by 17.2 million persons,[129] women made up less than 18 percent of the total.[130]

What can be said about the changes in Chinese society in the last 30 years that made possible the enormous increases in the number of working women in urban areas since 1958? For many years one plank in the Party's general line on work among women (funu gongzuo) [131] has been "to liberate women from the drudgery of housework." Housework is still a burden for women, but today, as the figures quoted above show beyond any doubt, most women in China's cities and towns feel free to work outside their homes. In addition, and perhaps more importantly, these women feel obliged to find remunerative jobs to help support their families, probably in part because of the peer pressure that school classmates, family members, and relatives exert on them. Widespread acceptance of family planning in urban areas unquestionably makes it easier for women to work full time. The reverse is also true, as is widely recognized in China.[132]

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[125] Emerson, "Sex, Age, and Level of Skill," 1965, table 2, p. 26.

[126] Deng Yingchao, speech, ZGFN, no. 2, Feb. 15, 1980, p. 15.

[127] Emerson, "Sex, Age, and Level of Skill," 1965, table 2, p. 26.

[128] Bureau of the Census, 1965, p. 128.

[129] Ibid.

[130] Emerson, "Sex, Age, and Level of Skill," table 2, p. 26.

[131] Delia Davin discusses and defines this term in her book "Woman-Work: Women and the Party in Revolutionary China," Oxford, 1976, pp. 17–18.

[132] See Sun Keliang's article on the employment of women and population control in ZGFN, no. 11, Nov. 15, 1980, p. 28.

Comments on this phenomenon by close observers of the Chinese scene include the following observations. Robert M. Field notes that the great increase in the employment of urban women almost certainly reflects among other things falling real wages. The increase occurred during a period when there were no general wage increases and the average urban household found it necessary to have more bread winners than before. Underlying this situation there must have been at least creeping inflation.

Nicholas Lardy says that this employment increase represents a willingness on the part of the government to hire urban women rather than young peasant migrants from rural areas. This attitude was consistent with the official policies of spending as little as possible on housing, of restricting urban population growth, and, as a corollary, of banning rural-to-urban migration.

Unlike women in urban areas even 30 years ago, most urban women today are literate and graduates of primary schools. Many are middle school graduates. Many have professional training and experience in education and medicine or in relatively new areas of technology, such as electronics. These women learn and master technical skills as easily as men.

Women without educational advantages now can and often do perform unskilled work that illiterate peasant migrants, mostly male, were doing in the 1950's. This substitution of women for men to meet urban demands for unskilled labor is an indication of the effectiveness of the ban on rural-to-urban migration.

B. Demand for Labor in Urban Areas

1. Labor planning and allocation

During the FFYP period (1953–1957), to estimate the demand for labor the State Planning Commission (SPC) used a mechanical labor plan patterned on a format and formulae then used in the Soviet Union and based on statistics supplied by the SSB. However, prior to the Big Leap Forward in 1958, neither labor planning nor labor statistics were ever considered satisfactory by the planning and statistical authorities. The Big Leap Forward wrecked any meaningful form of economic planning.[133] Thereafter, prior to the start of the Cultural Revolution in 1966, no attempt was made to restore labor planning to the level of development it had attained in the 1950's. The Cultural Revolution destroyed whatever economic planning had survived until 1966, and it was not until 1975 at the earliest that any efforts were made to resume work on economic planning. However, reports by top officials of the SPC covering the years 1978–1980 include data on employment levels for each year.[134] These data show the results of the resumption of labor planning at the national level. The censuses of workers and employees and of scientific and technical personnel taken in 1977 and 1978, respectively,[135] form much of the basis for the revival of labor planning work.

The old format copied from the Soviet labor plan was discarded, and a more flexible approach adopted. One of the main objectives of the new form of labor planning is to estimate the number of persons who will be looking for work in urban areas in the current year as a basis for finding jobs for as many of them as possible.[136] There is a great difference between the old and new forms of labor planning, since the latter requires realistic estimates of the number of new entrants to the urban labor force and of the number of unemployed in urban areas, whereas after the start of the Big Leap Forward in 1958 unemployment was abolished by administrative fiat and so could not be officially recognized as existing. The admission that unemployment does exist at present in urban areas is related to a charge in the role of urban labor bureaus.

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[133] Emerson, 1967, pp. 435–437.

[134] For example, the summaries of two reports by Li Renjun, Assistant Director of the SPC, one on results of the national economic plan in 1979 and the other on targets of the national economic plan for 1980, RMRB, Apr. 2, 1980, p. 1.

[135] SSB, "Statistical Work in New China," p. 4.

The monopoly on job allocation formerly exercised by urban labor bureaus has been sharply attacked by the prestigious Xue Muqiano, Advisor to the SPC and former Director of the SSB. Xue's criticism is not to be taken lightly in view of his position as head of the working group of members of the Economic Research Institute responsible for recommendations on reform of the economic management system, that is centralization versus decentralization, the role of economic planning, pricing policy, etc.[137]

Here is what Xue wrote in an article published in August 1979.[138]

> In the early 1950's, those wanting a job could look for it themselves. After all private industrial and commercial enterprises were turned into state-private joint enterprises in 1956, particularly after state-private joint commercial enterprises were upgraded to state commercial enterprises and handicraft cooperatives to cooperative factories, state labor departments were made responsible for the placement and recruitment of all workers and staff in these enterprises. One consequence of this was that the extensive network of handicraftsmen and small shopkeepers and peddlers shrank drastically and the vast varieties of goods they produced or dealt in were also greatly reduced. . . .
>
> At the first session of the Eighth Party Congress held in 1956, Comrade Ch'en Yun suggested that mergers of state-private shops and cooperative should not be overdone and that the heterogeneity of their products and the flexibility of their management should be preserved. However, after 1958 state-private shops and handicraft cooperatives which were responsible for their own profits and losses were practically eliminated at one stroke . . . Service trades also drastically declined. On the one hand, many kinds of work which society badly wanted done had nobody to do them, while on the other hand a large number of people wanting jobs could not find suitable work. It is not that there is no work for them; it is that they have to wait for the government to give them work. But the urban state enterprises have been unable to absorb them all. Hence the number of youths awaiting employment has been mounting.
>
> The fundamental solution to this question lies in developing production and creating the greatest possible number of jobs. To this end the current labor administrative system must be modified.
>
> The system of assigning work to all youths by state labor departments alone cannot be maintained any more. Such being the case, young people should be allowed to organize themselves and engage in production. This must not be prohibited. Instead, the state should help them and give them leadership. There are plenty of job opportunities in the cities; the point is whether people are allowed to find and fill these jobs without waiting to be assigned by the labor departments.
>
> Some say that there are jobs, but the urban youths do not want them. For instance, they particularly shun service trade jobs. This may be partly because young people with some particular bent or knowledge are being assigned to them. . . . This new method of recruitment will change this. Job applicants now apply

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[136] This is the form of labor planning outlined in Wei Min, "More Than 7 Million People Employed," Beijing Review (hereafter BR), no. 6, Feb. 11, 1980, pp. 13–19.

[137] Many of Xue Muqiao's views on these and other subjects of great, current importance are to be found in his "Zhongguo shehuizhuyi jingji wenti yanjiu" ("Chung-kuo she-hui-chu-i ching-chi wen-t'i yen-chiu" in Wade Giles transliteration (Studies and problems in China's socialist economy). Beijing, December 1979, p. 273.

[138] Xue Muqiao's article on employment, BR, vol. 22, no. 33, Aug. 17, 1979, pp. 13–14.

> and sit for an exam, so only those who qualify are recruited. Whereas before, people were arbitrarily assigned to any vacancy by the labor departments. The result was that enterprises could not get people they wanted and could not refuse those they would rather not have. And young people were given work they were not interested in but had to accept. So why should such a system of labor recruitment be maintained?

A large number of newspaper articles in the second half of 1979 and continuing into 1981 testify to the fact that Xue Muqiao's recommendations on relaxing hiring practices and allowing people to look for work on their own and find jobs without the mediation and approval of the labor bureaus have been accepted by the Party and government administration. These articles, many of them published in local newspapers, describe in considerable detail how tens of thousands of young people in city after city are finding jobs on their own, as Xue suggested they could.

After a lapse of more than 20 years Chinese labor specialists have once again begun to write on problems of employment in urban areas.[139] Those new analyses of the causes and size of urban unemployment will form the basis of an article on unemployment that the author of this chapter has agreed to write for The China Quarterly. The subject is beyond the scope of this chapter.

2. Size and distribution of nonagricultural labor

a. Total nonagricultural employment.—As the data in table 3 show, official figures on nonagricultural employment in recent years are available only from 1977, the year of the most recent census of workers and employees.[140] A nonagricultural employment series for 1975 consists of estimates made by Thomas Rawski, many of which may be very close to the SSB data but which incorporate few SSB figures as sources.[141]

These figures show a great expansion of nonagricultural employment between 1957 and 1979 from 35 to 94 million, an increase of nearly 60 million persons or 169 percent. They indicate a great increase in economic activity in nonagricultural branches of the economy, particularly in industry and construction, as the sections below on these two branches of the economy spell out in some detail. In the same period the urban population has roughly doubled, if the definition of "urban" used in 1957 is also used for 1979. The doubling of the urban population and near trebling of urban employment (1957=100, 1979=269) has unquestionably caused sharp rises in labor force participation rates in urban areas, particularly among women (as noted above).

b. Women's share of nonagricultural employment by branch of the economy.—The steady rise in the proportion of nonagricultural workers and employees who were women dates from 1958 with the start of the Big Leap Forward. In that year, the proportion rose from 13.4 to 15.4 percent, as the number of women workers and employees more than doubled (table 7). In the next year, as the Big Leap Forward began to crumble, the proportion of workers and employees who were women rose again, this time by 3.4 percentage points to reach 18.8 percent, as nearly 3.5 million women were hired to staff newly opened "street" industries, as workshops under neighborhood management were called.[142] The PRC has published next to nothing about employment developments during the economic crisis into which China was thrown, as the Big Leap Forward collapsed in 1960 and 1961. According to one set of estimates by the author, which are based on very incomplete data for 1960 and 1961, nonagricultural employment declined by 20 percent from 56.9 million in 1958 to 45.5 million in 1961.[143] Elsewhere the number of workers and employees is reported to have peaked at 60 million in 1960, and then fallen by 20 million over a three-year period.[144] Whatever the actual number of workers and employees at the end of 1961, it was down sharply from 1958.

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[139] *E.g.*, Feng Lanrui and Zhuo Lükuan, article on employment problems in China, in Zhongguo shehui kexue (Social sciences in China), no. 6, November 1980, pp. 189–200 and Feng Lanrui, article on unemployment, RMRB, Nov. 16, 1981, translated in FBIS, no. 224, Nov. 20, 1981, K2–K6

[140] SSB, "Statistical Work in New China," p. 4.

[141] Thomas G. Rawski, 1979, table 2–8, p. 37.

Women's losses were evidently severe during this cutback, although men suffered the heaviest losses at first in the initial plant closings and suspensions of work that occurred in heavy industry and construction work in 1959, where women's shares of employment were very small.[145] An economic turnaround started in 1962, but apparently women were slow to recover the losses they had suffered during the worst of the economic crisis. By 1966 there were reportedly 8.26 million women workers and employees (table 7), a few thousand less than the number reported for 1959, even though there were 4.5 million more workers and employees in 1966 than in 1959.

The net increase in the numbers of women workers and employees during the eight-year period 1958–1965 was negligible, less than 2 million. Most of the 34 million women workers and employees reported employed in 1980 were hired during the 14 years 1967–1980 (see table 7). These were the years during which the revolution in the employment of women occurred.

With the suspension of most publishing in China during the Cultural Revolution, the closing down of the SSB, and the abolition of the Women's Work Department of the CCP Central Committee in 1966, even less information is available on the employment of women in the first five years of the period than for the early 1960's. As noted earlier, it was only in the later years of the 1970's that there was anything approaching a return to normal statistical work. In view of the marked deficiencies in statistics for the 10-year period 1966–1975, the estimates given for these years should be considered only as tentative.

Of the increase of 50 million workers and employees between 1965 and 1979, three-quarters occurred in the last 10 years of the 15-year period and only one quarter in the first five years (table 7). The distribution of the additions of women to the ranks of workers and employees during the whole period is probably even more skewed than that of the increases in total numbers, since in most years since 1949 when job openings in China have been scarce, men have been given most of the few jobs that were available—1955 and 1957 are cases in

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[142] "New Stage in the Women's Emancipation Movement in Our Country," editorial, RMRB, Mar. 8, 1960; translated in SCMP, no. 2215, Mar. 14, 1960, p. 9 and "Women Can Do Anything and Do Anything Well," ZGFN, no. 1, January 1960, p. 10, which gives the proportion of those employed in street industries who were women as 85 percent.

[143] Figures quoted from Audrey Donnithorne, China's Economic System, New York, 1967, p. 181 (hereafter cited as Donnithorne, 1967), where they are cited to John Philip Emerson, "Chinese Communist Views on Labor Utilization Before and After 1958," Current Scene, vol. 1, no. 30, April 1962, p. 5.

[144] Hsiang Huiwen's article on household work in Xin guangcha (New observer), no. 10, May 25, 1981, p. 14.

[145] Emerson, see "Sex, Age, and Level of Skill," pp. 8, 9, and 26.

TABLE 7.—WORKERS AND EMPLOYEES, BY SEX: SELECTED YEARS, 1949–80

[In thousands]

Year	Both sexes (1)	Male (2)	Female (3)	Percent of total: Male (4)	Percent of total: Female (5)
1949	8, 004	7, 404	600	92. 5	7. 5
1952	15, 804	13, 456	1, 848	88. 3	11. 7
1953	18, 256	16, 124	2, 132	88. 3	11. 7
1954	18, 809	16, 347	2, 435	87. 0	12. 9
1955	19, 076	16, 603	2, 473	87. 0	13. 0
1956	24, 302	20, 964	3, 266	86. 5	13. 5
1957	24, 506	21, 220	3, 286	88. 6	13. 4
1958	44, 323	38, 323	7, 000	84. 6	15. 4
1959	44, 156	36, 870	8, 286	81. 2	18. 8
1966	49, 650	41, 390	8, 260	83. 4	16. 6
1978	94, 990	64, 990	30, 000	68. 3	31. 7
1979	99, 670	66, 670	31, 000	68. 9	31. 1
1980	101, 440	70, 440	34, 000	67. 4	32. 6

Note.—The 49,650,000 total is the number of workers and employees in 1965.

Sources:

Col. 1: Figures for the years 1949–58 are from SSB, "The Great Ten Years," p. 159.

1959: Xu Xin-xue's article on development of the economy, HC, no. 3, Feb. 1, 1960, translated in ECMM, No. 203, Mar. 7, 1960, p. 2.

1966, 1978–80: "Zhongguo jingji nianjian 1981" (Chinese economic yearbook 1981), Xue Muqiao, Ma Hong, and Chen Xian, eds, Beijing, p. VI–7.

Col. 2: Residuals.

Col. 3: 1949–58: SSB, "The Great Ten Years," p. 161.

1959: "New Stage In The Women's Emancipation Movement In Our Country," editorial, RMRB, Mar. 8, 1960, translated in SCMP, No. 2215, Mar. 14, 1980, p. 8.

1966 and 1978: Sun Keliang's article on the employment of women and population control in ZGFN, No. 11, 1980 p. 28.

1979: Deng Yingchao's speech in ZGFN, No. 2, Feb. 15, 1979, p. 15.

1980: Kang Xeching's speech, ZGFN, No. 4, Apr. 15, 1981, p. 2.

point (table 7) as a matter of Party policy.[146] If this pattern of preferential hiring of men in hard times holds true for the 1970's as it did in the 1950's, it is likely that most of the 17 million women who became workers and employees between 1966 and 1979 were hired in the latter part of the decade of the 1970's. It should be noted that there is strong evidence that this pattern of the 1950's is repeating itself in the first years of the 1980's.[147]

Demand for the labor of women in the nonagricultural labor force of China is clearly indicated by their distribution by branch of the economy, branch of industry, and type and level of skill. Comparison of these distributions today with those of 20 years ago (table 8) shows very great shifts in demand for female labor in urban areas of China. Industry, the largest of the nonagricultural branches of the economy with nearly 43 million workers and employees in 1978 probably employs about half the total number of women workers and employees, or about 15 million.[148] This number equals almost 35 percent of the total number of workers and employees in industry, nearly double the share of industrial jobs that women held in 1958 (table 8).

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[146] See Thornborg, 1980, pp. 76–97.

[147] Among delegates who spoke at a recent session of the Beijing Municipal People's Congress, Li Zhong (2621 1813) noted that during labor recruiting campaigns of the last few years young men were given preference over women so that the number of young women waiting for work has been increasing year by year. For this, see RMRB Apr. 30, 1981, p. 3.

[148] This estimate and those that follow in the next for other branches of the economy total 24 million, leaving 7 million unaccounted for by branch of the economy. Construction and transport, posts, and telecommunications have traditionally employed only very small numbers of women (of this, see Emerson, "Sex, Age, and Level of Skill," p. 9). It seems likely that a large proportion of the 7 million work in industry with the remainder scattered throughout other branches of the economy.

TABLE 8.—NONAGRICULTURAL EMPLOYMENT, BY SEX AND BRANCH OF THE ECONOMY: 1957, 1958, AND 1978

[Figures are yearend, except those marked by asterisks, which are third quarter, and are in thousands]

Branch of the economy	1957			1958			1978			Percent distribution								
										1957			1958			1978		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Total	39,667	32,915	6,752	56,867	46,781	10,086	94,990	63,990	31,000	100	83.0	17.0	100	82.3	17.7	100	67.4	32.6
Material production branches	30,953	(1)	(1)	47,918	39,970	7,948	---	---	---	100	(1)	(1)	100	83.4	16.6	---	---	---
Handicrafts and carrier services	6,560	4,592	1,968	1,465	1,025	440	---	---	---	100	70.0	30.0	100	70.0	30.0	---	---	---
Salt extraction	500	300	200	700	350	350	---	---	---	100	60.0	40.0	100	50.0	50.0	---	---	---
Fishing	1,500	1,350	150	2,000	1,350	650	---	---	---	100	90.0	10.0	100	67.5	32.5	---	---	---
Industry	7,907	6,537	1,370	23,734	19,420	4,314	42,560	27,560	15,000	100	82.7	17.3	100	81.8	18.2	100	64.8	32.2
Water conservancy	340	(1)	(1)	1,360	1,224	136	---	---	---	100	(1)	(1)	100	90.0	10.0	---	---	---
Capital construction	1,910	(1)	(1)	5,336	4,562	774	---	---	---	100	(1)	(1)	100	85.5	14.5	---	---	---
Transport, posts, and telecommunications	4,417	(1)	(1)	5,823	5,439	384	---	---	---	100	(1)	(1)	100	93.4	6.6	---	---	---
Modern	1,878	(1)	(1)	2,955	2,687	268	---	---	---	100	(1)	(1)	100	90.9	9.1	---	---	---
Traditional	2,539	2,459	80	2,868	2,752	116	---	---	---	100	96.8	3.2	100	96.0	4.0	---	---	---
Trade and the food and drink industry	7,819	6,873	946	7,500	6,600	900	1,000	9,000	2,000	100	87.9	12.1	100	88.0	12.0	100	81.8	18.2
Modern	5,245	4,608	637	4,835	4,065	770	---	---	---	100	87.9	12.1	100	84.1	15.9	---	---	---
Traditional	2,574	2,265	309	2,665	2,535	130	---	---	---	100	88.0	12.0	100	95.1	4.9	---	---	---
Nonproductive branches	8,714	(1)	(1)	8,949	6,811	2,138	---	---	---	100	(1)	(1)	100	76.1	23.9	---	---	---
Finance, banking, and insurance	621	(1)	(1)	400	250	150	---	---	---	100	(1)	(1)	100	62.5	37.5	---	---	---
Services	489	391	98	489	391	98	---	---	---	100	80.0	20.0	100	80.0	20.0	---	---	---
Medicine and public health	1,908	(1)	(1)	2,160	1,136	1,024	4,050	2,350	1,700	100	(1)	(1)	100	52.6	47.4	100	58.0	42.0
Modern	545	(1)	(1)	553	304	249	---	---	---	100	(1)	(1)	100	55.0	45.0	---	---	---
Traditional	1,363	684	679	1,607	832	775	---	---	---	100	50.2	49.8	100	51.8	48.2	---	---	---
Education and cultural affairs	2,666	(1)	(1)	3,463	2,942	521	10,530	5,530	5,000	100	(1)	(1)	100	85.0	15.0	100	52.5	47.5
Government administration	1,698	(1)	(1)	1,183	933	250	---	---	---	100	(1)	(1)	100	78.9	21.1	---	---	---
Mass organizations	1,181	(1)	(1)	1,076	999	77	4,680	3,250	1,450	100	(1)	(1)	100	92.8	7.2	100	69.0	31.0
Urban public utilities	133	(1)	(1)	150	135	15	---	---	---	100	(1)	(1)	100	90.0	10.0	---	---	---
Meteorology	15	(1)	(1)	28	25	3	---	---	---	100	(1)	(1)	100	89.3	10.7	---	---	---
Other	---	---	---	---	---	---	---	5,850	---	---	---	---	---	---	---	---	---	---

[1] Data not available and no estimate made.

Source: John Philip Emerson, "Sex, Age and Level of Skill of the Nonagricultural Labor Force of Mainland China," n.p., Foreign Demographic Analysis Division, U.S. Bureau of the Census, June 1965 and estimates in this chapter.

Of the 15 million total, 9 million women, or 60 percent of the women employed in industry, work in collective [149] and handicrafts,[150] activities in which women have traditionally outnumbered men.[151] Five million or so work in the light industry system, which in 1980 was reported to employ 10,450,000 workers and employees.[152] There are probably fewer than 2 million women employed in heavy industry.

At least 6 million women work in state-owned industrial enterprises, and of these more than 1.5 million work in textile mills, which at present employ 2.6 million workers and employees,[153] and in which women have traditionally accounted for at least 60 percent of the work force.[154]

In trade more than 2 million women, or at least 20 percent of the work force, worked as clerks and sales girls in 1978. This number is more than twice as large as the number of women estimated to have been employed in trade in 1957 (table 8). It represents nearly a doubling of women's share of the jobs in this branch of the economy, which together with services [155] and the food and drink industry have been in a steady decline since 1951.[156] So serious has the deterioration been in the Chinese equivalent of what in the United States is called the third or service sector that a succession of Chinese commentators have noted with alarm that the almost complete disappearance of traditional Chinese services in some areas is a serious impairment of the functioning of everyday life.[157]

Prior to the Big Leap Forward which began in 1958, women's share of teaching positions remained constant in the first three years of the FFYP period at about 20 percent but declined to 17 percent in 1956 and 1957, when only 10 percent of 500,000 newly hired primary school teachers were women.[158] In 1958 when primary school enrollment rose by 34 percent to nearly 90 million in 1958,[159] and the number of primary schools increased by 71 percent to 936,000,[160] large numbers of new teachers, predominantly women, were hired to staff the new schools. This pattern of hiring continued through 1963, when the proportion of primary school teachers who were women reached 32 percent,[161] and in subsequent years, since by 1978 about 4.5 million of the total of 9 million teachers in China were women, the great majority of them primary school teachers. The great rise in the educational level of urban women since 1949 accounts in part for this increase. Low pay [162] and the unpopularity of primary school teaching is probably also part of the reason for the steady increase over 20 years in women's share of primary school teaching positions. High turnover rates among primary school teachers have facilitated this increase.[163] High turnover rates, in turn, are generally indicators of the unpopularity of the work in question. People are willing to take such jobs only because they can find nothing better. They move on as soon as they find something better.

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[149] Ibid., loc. cit.

[150] Ibid., pp. 7–8.

[151] Emerson, 1967, p. 435, and Emerson, "Sex, Age, and Level of Skill," p. 9.

[152] This figure is given in Lu Luping's article on light industry in RMRB, Apr. 11, 1980, p. 5.

[153] More than 470,000 workers and employees of the textile industry system are taking part in space time education. They constitute 18 percent of total employment in the industry, according to an article on sparetime education in the textile industry in GMRB, Apr. 18, 1980, p. 1.

[154] Emerson, "Sex, Age, and Level of Skills," p. 8.

[155] Defined in the PRC as including hotels, bathhouses, barbershops, photographic studies, and cleaning and dyeing establishments. For this, see Emerson, 1965, p. 154.

[156] For trade employment figures in the 1950's, see Emerson, 1965, table 1, p. 128.

[157] E.g., Xue Muqiao's article on employment, BR, vol. 22, No. 33, Aug. 17, 1979, pp. 13–14.

[158] Emerson, "Sex, Age, and Level of Skill," p. 10.

[159] Ibid., p. 11.

[160] Bureau of Economic Analysis, 1973, table A–5, p. 94.

[161] Training of Primary School Teachers in China, NCNA-English, May 27, 1964, in SCMP, no. 3226, June 2, 1964, p. 11.

[162] Primary school teachers' salaries have been among the lowest in China since the founding of the PRC in 1949. For this, see Emerson, "Sex, Age, and Level of Skill," p. 11.

In 1978, 47 percent of all public health personnel, or about 1.7 million, were women, of whom 1.4 million worked as nurses and midwives.[164] Employment in medicine and public health increased from 2.16 million in 1958 [165] to 3.6 million in 1978. Women comprised 700,000, or 49 percent of the increase of 1.44 million persons, and women's share of employment in this branch of the economy remained unchanged as compared with 1958 when it was 47 percent.[166] In other words the employment structure by sex in this branch remained unchanged over a 20-year period.

Probably there were half a million women employed in cultural affairs in 1978, or about 39 percent of total employment in this branch. A comparison of women's share of employment in cultural affairs in 1978 and 1958 cannot be made, because comparable data for 1958 are not available.

In 1978, at least 21 percent of workers and employees in government administration and mass organizations were women, or about 1.45 million.[167] The actual number may have been larger, since it is unlikely that women's share of employment in this branch fell over the 20-year period.

c. The socialist sector.—As defined in the PRC, the socialist sector consists of state-owned and collectively owned units. State-owned units consist of what were state-owned and state-private jointly managed enterprises and undertakings in 1957. The collective sector in urban areas is made up of what were cooperative enterprises in handicrafts, salt, fishing, construction, trade, and credit in 1957 and so-called street industry enterprises set up by groups composed mostly of women during the Big Leap Forward.[168]

According to table 5, employment in collective units has been growing somewhat faster than in state-owned units during the years 1977–1979. As a consequence the state-owned units' share of the total number of workers and employees fell by nearly 2 percentage points during this period, from 79.0 to 77.2 percent while the collective share rose by the same amount. This trend may accelerate and collective units may become a much more important source of new jobs than in the recent past. Even then, as noted above, they were hiring year by year more new workers than state-owned units, despite the much larger size of the latter units. The nationwide campaign mounted in the second half of 1979 to increase production and employment in existing forms of collectively owned enterprises is also extending the kinds of work undertaken by collectives in urban areas into branches of the economy in which collectives earlier played little or no part, for example, construction and repair, carrier and moving services, fast food, laundry, and other services which are now either nonexistent or moribund. As noted above, Xue Muqiao has been one of the most outspoken advocates and supporters of the campaign, writing article after article on the subject. There must have been considerable opposition to the idea of this form of enterprise, for in August 1979 he wrote:[169]

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[163] For this, see Bureau of Economic Analysis, 1973, p. 53.

[164] These figures are given in "The Growth of the Chinese Labor Force, 1957–1980" notes to table 2, "Workers and Employees by Branch of the Economy 1957 and 1977–1980." This is a forthcoming publication in the Foreign Economic Report series of the Bureau of the Census, Foreign Demographic Analysis Division.

[165] Bureau of the Census, 1965, table 11, p. 142.

[166] Emerson, "Sex, Age, and Level of Skill," table 2, p. 26.

[167] This is the share for 1958 given in Emerson, "Sex, Age, and Level of Skill," table 2, p. 26.

[168] Bureau of the Census, 1965, pp. 50–51. For a recent Chinese description of these kinds of cooperatives, see Zhongguo shehui kexue yuan jing yanjiu so (Chinese Academy of Sciences, Economic Research Institute), "Zhongguo zibenzhuyi gongshangye di shehuizhuyi gaizao" (Socialist transformation of China's capitalist industry and trade), Beijing, Renmin chubanshe, 1978, pp. 224–239.

> We have been talking about services that should be introduced or reintroduced in the cities. Not very long ago, some people thought erroneously that these enterprises were "capitalist loopholes," and had to be stopped by hook or by crook. What we should do today is to enlarge these "loopholes" into gates. In other words, we should set up more collectively owned enterprises. Our Constitution stipulates that "the state allows nonagricultural individual laborers to engage in individual labor involving no exploitation of others, within the limits permitted by law." This should be put into practice. And once this is actually practised, the urban employment question will not be so acute.

d. The private sector.—Following the transformation of virtually the entire private sector of the economy into various forms of state and collective ownership in 1956, the remaining employment in private establishments in nonagricultural branches of the economy within three years fell to almost nothing, from 49 percent in 1955 to 11 percent in 1956, to 10 percent in 1957, and to 3 percent in 1958.[170] What little remains today, more than 20 years later, is unknown, but people who can afford it still employ domestics (cooks and maids), as recent visitors to China have noted repeatedly in the households of their relatives and friends. Since the downfall of the "gang of four" and reinstitution of traditional forms of higher education, employment of private tutors (for instruction in foreign languages and music) has become increasingly common. However, such work is probably what is called moonlighting in the United States—that is, a second job. Various professions and trades still exist that provide the services of single individuals and require few material inputs, for example, seal cutting, letterwriting, job typing, portrait painting, scroll mounting, tailoring,[171] traditional skills of repairing teeth, making glass eyes, and some forms of funeral services.[172]

In addition, there is a wide range of types of self-employment in the modern sector from such work in new fields of high technology as specialized repair of new electronic devices to the age-old professions of prostitution and pimping, and possibly also resumption of traditional forms of organized crime (e.g., the Green Gang, etc.) known to everyone in urban China up to 1949.

Very little can be said in quantitative terms about the size of these remnants of the private sector. It is probably impossible to make accurate estimates of the size of any of the individual professions and trades listed above, to say nothing of the total numbers of persons in all of them. One study by the author of nonagricultural employment estimated that in 1949 there were about 2.9 million domestic servants and at least 500,000 persons in these professions and trades and in camel and yak driving and other traditional means of transport not covered by SSB statistics, or about 3.4 million in all, and that the number of persons in these three types of employment had fallen to 3 million by 1957.[173] They equalled 13 percent of the nonagricultural employment estimate for 1949 and 8 percent of a comparable estimate for 1957 given in the same study.[174] If they made up 5 percent of nonagricultural employment today, there would be about 5 million persons in these three employment groups (not counting the number of moonlighters).

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[169] Xue Muciao's article on employemnt, BR, vol. 22, No. 33, Aug. 17, 1979, p. 15.
[170] Absolute figures given in Bureau of the Census, 1965, table 3, p. 130.
[171] "China's New Directions," Asia Week, July 24, 1981, p. 35.
[172] Bureau of the Census, 1965, p. 43.

e. Production and nonproductive branches.—The shares of nonagricultural employment that the production and nonproductive branches make up have not changed much since 1957. In that year the production branches of the economy accounted for 79.0 percent and the nonproductive branches for 21.0 percent of total nonagricultural employment (table 4). In 1978 they comprised 76.5 and 23.5 percent, respectively. The gain of 2.5 percentage points in the nonproductive branch share of nonagricultural employment represents massive increases in the numbers of teachers and public health personnel. During this period there have been absolute increases of 38.4 million in the production branches and 13.5 million in the nonproductive branches.

Industry.—Employment in industry has grown more rapidly than in any other production branch since 1957, rising from 11.4 million to 42.6 million in 1978, an increase of 31.2 million workers and employees or 274 percent. Of this increase, heavy industry accounts for 24 million workers and employees, or more than 75 percent of the total, leaving 7 million for light industry.[175] The number of industrial enterprises has grown from 60,000 in 1956 [176-177] to 350,000 in 1979, an increase of 483 percent.

It seems likely that most of the growth in industrial employment has occurred since 1965, when, according to one estimate, there were 14 million workers and employees industry and handicrafts combined.[178] An increase of 28 million since 1965, trebling the industrial work force, is consistent with a major criticism of the performance of industry by Hu Qiaomu, Director of the Chinese Academy of Social Sciences (CASS), that increases in industrial output in China in recent years have been made possible only by increases in the number of workers and employees and without increases in labor productivity.[179] One index of industrial output with 1957=100 puts 1965 at 204 and 1975 at 538.[180] An extension of the index puts 1977 at 620.[181]

One characteristic of China's industry that sets it apart from all other industrial systems is the degree to which it is politicized. Political disturbances in China affect industrial production almost as soon as they break out. According to one study, measurable political instability, varying from province to province, was matched almost without exception by comparable variations in rates of growth in industrial output.[182] Politically stable provinces had high rates of growth in industrial output, while politically unstable provinces had low or negative rates of growth.

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[173] Ibid., pp. 72–73.

[174] Ibid., table 1, p. 128 gives nonagricultural employment estimates of 26,267,000 for 1949 and 39,667,000 for 1957 that exclude domestic servants and the professions, trades, and traditional means of transport not covered by SSB employment figures.

[175] There were 3.16 million workers and employees in consumer goods industry in 1957 (Bureau of the Census, 1965, table 12, p. 143) and 10.45 million in the light industry system in 1979 (Lu Luping, loc. cit.).

[176-177] Bureau of the Census, 1965, table 6, p. 136.

[178] Emerson, 1967, p. 445.

[179] Hu Qiaomu.

[180] Robert Michael Field, Nicholas R. Lardy, and John Philip Emerson, "Provincial Industrial Output in the People's Republic of China: 1949–1975," Foreign Economic Report, No. 12, Bureau of the Census, Washington, D.C., 1976, p. 17.

[181] Central Intelligence Agency, "China: Gross Value of Industrial Output, 1966–67," ER 78–10355, June 1978, p. 8.

Capital construction.—The number of workers and employees in capital construction rose from 2.1 million in 1957 to 7 million in 1978, an increase of 233 percent. Most of this work force has been devoted to the construction of factories, nearly 300,000 since 1957 (as noted above under "Industry"), most of them in heavy industry. Like industry, construction in recent years has suffered from a lack of growth in labor productivity, or perhaps even from negative growth. Construction plans were not satisfactorily completed in 1978.[183] There have been reports of deferred, extended, and cancelled construction projects in 1979.[184] Many of these shortcomings in construction were discovered in a major investigation of the construction industry conducted in 1978.

Transport, postal, and telecommunications.—Between 1957 and 1978 3.2 million workers and employees were added to the transport, postal, and telecommunications systems of China, bringing the total to 7.45 million and representing an increase of 75 percent. Truck and bus drivers, numbering 3 million in 1979,[185] made up most of this increase, since they numbered fewer than 300,000 in 1957.[186] Railway employment remained stagnant at the 1958 level of more than 2 million.[187] Lack of development in these three branches of the economy is indicated by a fall of nearly 50 percent in their share of nonagricultural employment between 1957 and 1978, as shown in table 4. In the original investment proposals that followed the announcement of the four modernizations policy, high priorities were given to doubletracking of major rail lines and development of port facilities, indicating urgent needs for such expansion of transport.

Trade and the food and drink industry.—Employment in trade and the food and drink industry grew from 7.82 million to 11 million between 1957 and 1978, an increase of only 41 percent. In 1978 employment in trade and the food and drink industry made up only 12 percent of nonagricultural employment as compared with 22 percent in 1957. As noted above, Xue Muqiao said repeatedly in 1979 that retail trade outlets, food, and other services were inadequate to meet popular demands, and offered the greatest potential for expansion and new jobs.

Public health and education.—Employment in education and public health increased by 11.5 million between 1957 and 1979. This figure equals the increase in all nonproductive branches of the economy during this period. China's 9 million teachers staffed a nearly universal primary school system with 150 million pupils in both urban and rural areas and middle schools with an enrollment of 60 million, 12 times the number of middle school students in 1957 and nearly 3 times as many as there were in 1965 (table 1).[188]

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[182] Robert Michael Field, Kathleen M. McGlynn, and William B. Abnett, "Political Conflict and Industrial Growth in China, 1965–1977," in Congress of the United States, Joint Economic Committee, "Chinese Economy Post-Mao," Washington, D.C., 1978, pp. 239–283.

[183] SSB, *Communique on Fulfillment of China's 1978 National Economic Plan*, June 27, 1979, N.P., p. 6.

[184] SSB, *Communique on Fulfillment of China's National Economic Plan*, Apr. 30, 1980, N.P., 1.5.

[185] Reported in an article by Xia Yanchao in Jingji guanli (Economic management), no. 12, 1979, p. 14.

[186] See Bureau of the Census, 1965, table 9, p. 140.

[187] Ibid., and Summary of World Broadcasts, part 3 the Far East, Weekly Economic Report, 10 May 1978, FE/W979/A/24.

TABLE 9.—WORKERS AND EMPLOYEES, BY BRANCH OF INDUSTRY: 1957, 1958, AND 1977-79

[Data for 1957 and 1958 are yearend, those for 1977-79 are annual averages; all data include only state sector employment]

Branch of industry	1957	1958	1977	1978	1979
Total, all branches	7, 907	22, 984	29, 566	29, 868	30, 381
Metallurgical industries	693	4, 034	3, 017	3, 068	3, 012
Electric power industry	143	251	701	742	786
Coal industry	669	2, 500	3, 653	3, 728	3, 770
Petroleum industry	67	124	480	485	478
Chemical industry [1]	253	800	2, 765	2, 875	2, 815
Machinery industry [2]	1, 403	4, 204	9, 107	9, 247	9, 175
Building materials industry	600	1, 320	1, 836	1, 848	1, 857
Timber industry	333	1, 126	1, 215	1, 181	1, 857
Food products industry [3]	1, 200	1, 410	1, 970	1, 934	2, 006
Textile industry	1, 282	1, 500	2, 576	2, 651	2, 740
Papermaking industry	94	96	382	389	410
Other [4]			1, 864	1, 770	2, 132

[1] Chemical industry includes: chemical ore extraction industry, basic chemical raw materials industry, chemical fertilizer and agricultural pesticides industry, organic chemical industry, chemical pharmaceutical industry, daily use chemical industry, rubber processing industry, plastics processing.

[2] Machinery industry includes: agricultural machinery manufacturing industry, industrial equipment manufacturing industry, communications equipment manufacturing industry, construction and road building machinery manufacturing industry, other production use machinery manufacturing industry, electronics industry, consumer use machinery manufacturing industry, production use metal products industry, daily use metal products industry, machinery, equipment, and metal products repair industry.

[3] Food products industry includes: grains and [edible] oils industry, salt refining industry, slaughtering and meat processing industry, aquatic products processing, canning, sugar refining, tea processing, cigarettes and flue-cured tobacco processing, alcoholic beverage manufacturing, egg and dairy products processing, and other food products (e.g., cold drinks, condiments, candy, biscuits, etc.).

[4] Other industries not included above.

Source: 1957 and 1958, Bureau of the Census, 1965 table 12, p. 143; 1977-79, United Nations Statistical Office.

Employment and production by branch of industry.—Although a wide variety of economic policies has guided China's economy during the last thirty years, as noted above, industrialization has always been the foremost goal of whatever policy was in effect at any given time, at least until very recently. Because of this industry has been the recipient of the lion's share of investment, which has averaged about 25 percent of gross national product during this period. Under these circumstances, there have been great increases in the numbers of industrial establishments and industrial workers and employees since 1957 (figures given above under *Industry*). However, growth in industrial performance during this period is entirely another matter.

In most industrialized or industrializing countries investment leads to a deepening of capital and is accompanied by increases in labor productivity. This is one, although probably not the best, way of measuring industrial performance. We do not know what data Hu Qiaomu was citing when he spoke of industrial production increases achieved by employment increases alone and not by increased labor productivity, and called this level of performance unsatisfactory.[189] However, we can easily approximate what he was referring to using detailed official information on production (table 10) and employment (table 9) in 11 branches of industry.

The method used is crude and simple, but the results are striking, showing great differences in performance from one branch to another.

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[188] For the 1957 and 1965 figures, see Bureau of Economic Analysis, 1973, table A-6, p. 95. For 1979 figures see table 1.

[189] Hu Qiaomu, loc. cit.

The method consists of dividing rates of increase in production by branch by rates of increase in employment by branch between 1957 and 1977.

The ratios of production increase rates over this period divided by rates of employment increases for the same period differ by as much as 400 percent. The ratio for the petroleum industry is the highest of any branch at 3.2 and that for the metallurgical branch is the lowest at 0.8. The 11 branches can be thought of as falling into three groups. Branches in the first group, including electric power and building materials in addition to petroleum, have ratios well above 2.5. Those in the second group, food processing and textiles, have ratios close to 2. The six branches in the third group have ratios that range from 1.5 for the machinery industry to 1.1 for the coal industry to 1.0 for the timber industry, 0.9 for the chemical and the paper industries, and finally to 0.8 for the metallurgical industry.

A detailed analysis of these ratios cannot be attempted here. The subject is necessarily complex, probably more so than it would be in a market economy, because account must be taken of fixed prices as major determinants of the gross value of industrial output of each branch. When the prices of the principal products of a given branch are set arbitrarily low by government fiat, as in the coal industry, that branch will never appear to be performing well in such comparisons as these.

TABLE 10.—GROSS VALUE OF INDUSTRIAL OUTPUT, BY BRANCH OF INDUSTRY: 1977-79

[In millions of constant 1970 yuan]

Branch of industry	1977	1978	1979
Total	372, 828	423, 075	459, 070
Metallurgical industries	29, 052	36, 891	41, 027
Electric power	14, 135	16, 142	17, 672
Coal industry	10, 312	11, 685	11, 808
Of which extraction	10, 191	11, 001	11, 624
Petroleum industry	22, 680	23, 329	24, 957
Of which petroleum and natural gas extraction	8, 394	9, 480	9, 803
Chemical industry	42, 366	52, 498	56, 184
Of which, basic chemicals and raw materials industry	5, 161	6, 167	7, 221
Fertilizers and pesticides	8, 083	10, 200	10, 690
Rubber and plastics for production use	8, 664	10, 240	11, 175
Chemical pharmaceuticals and daily use chemicals	8, 785	9, 981	10, 01
Machinery industry	103, 710	115, 546	124, 484
Agricultural machine building	10, 676	11, 588	10, 913
Industrial equipment building industry	22, 392	25, 541	24, 027
Communications equipment building industry	11, 183	12, 720	14, 542
Building and road building machinery	507	553	862
Production use machinery construction	4, 365	5, 107	6, 040
Building material industry	13, 334	15, 391	16, 732
Cement and cement products industry	4, 122	4, 877	6, 003
Refractory materials, ceramics, brick, and lime	6, 964	8, 071	8, 119
Glass industry	1, 056	1, 167	1, 278
Nonmetallic minerals	1, 192	1, 276	1, 332
Timber industry	7, 000	7, 741	8, 475
Of which, logging and timber transport	2, 703	2 805	2, 976
Food products industry	43, 574	47, 171	51, 872
Textile industry	46, 065	52, 909	59, 306
Of which, chemical fibers	2, 265	3, 129	3, 781
Paper industry	4, 754	5, 384	6, 030
Other	35, 846	38, 388	40, 523

Source: United Nations Statistical Office.

CHINA'S URBAN POPULATION: CONCEPTS, CONGLOMERATIONS, AND CONCERNS

By Leo A. Orleans*

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INTRODUCTION

While modernization normally implies urbanization, China has been attempting to modernize without increasing the proportion of the population that lives in cities and towns. This may be a unique experiment in the history of nations and has required innovative approaches to many economic and social problems. Some have worked, some have failed, and some are still being tested. But while China is struggling with unemployment, pollution, housing shortages, land use, consumer services and innumerable other difficulties that stem from urban growth, Beijing does not know how many people live in the urban areas. The fault is not simply with the inadequacies of the statistical systems, which are indeed serious, but also because new urban and rural settlement patterns have made it extremely difficult to identify the urban population. This paper reviews some of these issues—but primarily from the perspective of China's population.

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Historically, the level of urbanization in a nation has been considered to be a useful index of social and economic change—of development. A large urban population usually suggests progress in industrialization, productivity, trade, and national income, as well as advances in education, health, standard of living, and political participation on the part of the population. Cities are also centers of science, literature, art and other cultural activities. It matters little that urban misery is more miserable than rural misery—there is an attraction in the cities. Young people from the countryside know that moving to the urban areas is a gamble, but they accept the almost inevitable period of wretchedness and despair, considering it prerequisite to the opportunities they hope will materialize, not only for themselves, but eventually for the families waiting to join them.

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*Very special thanks to my "can do" friend, Dorothy Clark.

Even in earlier centuries, cities tended to grow too rapidly, but this growth was moderated by two factors, both related to mortality. First, in all countries, the rate of natural increase of the population was quite low, so that there was no pressure of excess manpower on agricultural land—no push. And second the death rate in the densely settled and epidemic-ridden cities was usually higher than in the countryside, resulting in a natural decrease of the population in some of the bad years. Only in this century—primarily since the Second World War—has uncontrolled urban growth become a critical problem in the world, and especially in the Third World. The convening of the United Nations Conferences on Human Settlements in Vancouver in June 1976 and on Population and the Urban Future in Rome in September 1980 is just one of the indicators of concern by world governments on this issue. A single statistic illustrates the dramatic evolution of urban areas: In the year 1800, the total population of all the cities of the world is estimated to have been 25 million—precisely the population figure projected for Greater Tokyo alone by the year 2,000. According to a recent study of the United Nations Fund for Population Activities, by the end of this century more than half of the world's population will live in urban areas, with 31 million in Mexico City, 25.8 million in Sao Paulo, 22.8 million in New York, and 17.1 and 16.7 million in Bombay and Calcutta, respectively.[1] As staggering as these projections are, other specialists come up with even higher proportions of urban population. That such hordes of humanity will exist and not fall victim to natural or man-made catastrophe seems unlikely, and projections of this type may, in a sense, be mythical. Nevertheless, the point is made.

Why is this problem of overurbanization so much greater now than in the past and why is it likely to get worse? Since the basic economic "pull" of the cities has changed little over the centuries, the main reasons for today's excessively rapid urban growth are related to the "push" factors. The postwar drop in mortality has caused the world's poorest countries to have the most rapid population growth, so that there is constantly increasing population pressure on the lands and resources in the rural areas. An additional shove is provided by various efforts to increase agricultural productivity through mechanization and the introduction of scientific methods, which also displace manpower. Thus, millions of poor, illiterate, unskilled people flood annually into the already overcrowded cities—cities simply incapable of providing adequate employment possibilities. What happens, of course, is that the facilities of the cities continue to deteriorate. The already strained sanitation and transportation services and energy and water supplies become more inadequate; health conditions become abysmal; and education becomes an impossible and impractical luxury. Under these ever-worsening conditions, it has become more and more apparent that cities can no longer play the role of springboard to social change and modernization. In fact, with uncontrolled growth, urban populations are no longer focal points for social advances and improvements, but rather tend to accentuate social problems and thereby represent a serious deterrent to raising the standard of living throughout the land.

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[1] As reported in The New York Times, June 15, 1980.

The experience of the People's Republic of China has been quite different from that of other developing nations. China's urban growth has had its ups and downs—periods of "blind infiltration" by the peasants and of forced evacuations—but over the past three decades, China has been able to limit the flow of population into the cities and thereby has avoided some of the worst consequences of urban sprawl. She has not found any magic solutions, however, and "success" is only relative. Her urban problems may appear somewhat more manageable simply by virtue of controlled urban migration, but they are actually numerous and serious. In a sense, by "bottling up" the rural population, Beijing has spread a host of problems more evenly between town and village. And, in a sense, this was Mao's intention.

Like Marx, Mao believed that there was a very unfair relationship between urban and rural areas—that cities tended to be "parasitic," to dominate and exploit the countryside. Furthermore, his revolution was, of course, built on the peasantry rather than the proletariat (yet another point of contention, incidentally, with the Soviet Union), and he considered the peasant to be "the vanguard of overthrowing the feudal forces, and the foremost heroes who have accomplished the great revolutionary undertaking."[2] It follows, then, that one of Mao's idealistic goals was to eliminate this antagonistic relationship between the city and the villages, which he could not even attempt until a variety of policy differences (which came to a head during the Great Leap period in the late 1950s) caused the Soviets to withdraw from China. In the early 1960s, agriculture was designated as the foundation of economic development, and policy stressed cooperation and unity between workers and farmers. But even though contradictions between town and village are too ingrained to be eliminated by decree, the post-1960 policies show a degree of continuity, through periods of both radicalism and pragmatism, in attempting to decrease the differences between urban and rural populations.

DEFINING URBAN

In most people's minds, the difference between urban and rural is as clear as the difference between land and water. Only when confronted with the concrete task of drawing lines or delineating patterns of settlement on a map, or of classifying individuals, and presenting statistics to characterize a nation's population, do serious problems of concepts and definitions arise. The complexities are such that international organizations like the United Nations have long since admitted futility and quit attempts, in the interests of comparability, to standardize the definition for "urban." Differences stem not only from diverse administrative and territorial organizations; national characteristics, too, are different and preclude establishing a single criterion for "urban" based on a minimum of inhabitants in a locality. In low density countries, a settlement of 1,000 inhabitants or even less may be considered urban, while in high density countries of Asia, for example, the criterion may call for 10,000 or more inhabitants before a location qualifies for urban designation. In recent decades, urban sprawl has made it even more difficult to draw precise lines and to proclaim population to be urban on one side of a line and rural on the other. Some rural areas may be incorporated within the boundaries of cities and towns. Conversely, the mobility provided by modern transport systems and private automobiles for the more affluent residents of Western and, to some extent, Third World cities, have made it possible for people to maintain certain urban values and pursue a wide variety of cultural opportunities, while maintaining their residence outside the city limits.

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[2] As quoted in Chester C. Tan, "Chinese Political Thought in the Twentieth Century," Doubleday & Co., Garden City, New York, 1971, p. 345.

For thousands of years, in China as in other parts of the world, no one thought to set down specific criteria for differentiating between urban and rural populations. Officialdom did not require such data and people knew simply that towns usually had walls around them, that such settlements were situated along the roads and rivers, that they housed the people in authority who made various rules and regulations, and that markets were there to buy, sell, or exchange a variety of produce and goods. It was not until the late 19th and early 20th centuries, and only under the impact of Westernization, that the first efforts were made to estimate the relative sizes of urban and rural populations—thus for the first time surfacing the problem of who should be counted where. It appears that some of the earliest work in China was done by Western scholars from a variety of disciplines, with the help of Chinese official and academic collaborators. They expended much effort in combining limited and approximate statistics from post office lists and other sources and in debating such issues as whether residents of market towns, which had both urban and rural characteristics, should be included or excluded from the urban count—a problem, as we shall see, which is yet to be resolved. In the final analysis, the definitional problems and the methodologies were no worse than the statistical data which had to be used in guessing the size of China's urban population.

OFFICIAL GUIDELINES

When the results of the 1953 census count were released in 1954, there was no clear idea of the guidelines that may have been used by the census officials in demarcating urban areas. However, two important documents discussing urban criteria became available in 1955. On November 11, 1955, the State Council published the "Criteria for the Demarcation between Urban and Rural Areas" [3] and the following month a statistical journal published an article by the State Statistical Bureau (SSB) entitled, "Explanation of Certain Major Problems Concerning Urban and Rural Definitions." [4] The first is a dry, organic regulation; the second covers the very same topics but is more revealing because it incorporates some of the more detailed considerations that went into the State Council's directive. Since these 1955 publications represent the only detailed discussions of China's urban criteria, since they suggest that these criteria closely approximate those used in 1953, and since many of the same questions would still apply today, their contents merit special attention.

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[3] Reproduced in H. Yuan Tien, "China's Population Struggle", Ohio State University Press, 1973, pp. 356–58.

[4] "T'ung-chi Kung-tso" (Statistical Work), no. 12, 1955. All pre-1978 references use Wade-Giles transliteration system, as in the original sources; more recent references use Pinyin.

In considering the criteria for "urban," the SSB studied the definitions used in the Soviet Union and then adapted them to the actual conditions in China, which means that an effort was made to retain some traditional concepts familiar to the Chinese people. As in the past, all settlements which were the seat of a county (xian) government (in 1955, the people's committees) were automatically classified "urban" no matter the size of their population. Using this definition, 900 localities with less than 2,000 inhabitants (193 with less than 1,000!) were designated as "towns" in the 1953 census. In discussing this criterion, the drafters of the regulations recognized that "from certain points of view" the people's pattern of living in such small communities was more typically rural than urban, but after due consideration decided to be "consistent with past tradition" and to continue to classify all localities which were xian-level administrative seats as urban.

Once this decision was made, the SSB had to set up some criteria for distinguishing between a city (zhen) and a market town (jizhen). Apparently in the past all xian centers, no matter what their size, fell into the cagetory of "cities" by virtue of their administrative functions. This was especially confusing because some had fewer than 2,000 inhabitants, while others (primarily the market towns) had 20,000 or more. It was finally agreed that only those xian centers with 20,000 or more permanent residents be classified as "cities," and all those with fewer inhabitants would be "towns." The problem was not entirely resolved, however, because the SSB concluded this discussion by saying that if some of the authorities feel that these criteria are unsuitable to their particular localities, they should draw up their own criteria and submit them for approval to the State Council.

The SSB followed the Soviet criteria much more closely in demarcating "urbanized residential areas." Any settlement with at least 1,000 people (the Soviets' limit for what they refer to as "urban-type settlements" was 2,000) and with more than half of the population engaged in nonagricultural work was to be considered an "urbanized residential area." This included industrial and mining areas, important communication points, large lumber yards, areas with sanatorium facilities, or simply residential settlements for workers and employees. In fact, there were few "urbanized residential areas" in China in the early 1950s, but their number began to increase rapidly in the middle of that decade.

Finally, both the State Council directive and the SSB article discuss the problems associated with the classification of suburban areas adjacent to large cities, or municipalities (shi). There is an interesting distinction between the two documents. The SSB decision provided for some local options. It stated that the suburban population occupied in agriculture should be listed under "rural," but if the suburb has close economic and cultural ties with the city, it should be included under "urban." The final directive of the State Council, however, stated very simply that "all the closely adjacent suburban residential areas that are contiguous to the municipality should be classified as urban areas regardless of the proportion of the agricultural population." Why the difference? We can speculate that, after considering the SSB recommendation, the State Council decided that, given the inadequacies in data and special local interests, it would be unwise to leave the final decision to the municipalities.

In practice, the suggested criteria have not been easy to implement. As will become apparent in the discussion that follows, it is specifically the municipalities, with their large areas and heterogeneous populations, that have been directly the cause for much of the confusion relating to the breakdown between urban and rural population.

RURAL CHANGES—A FACTOR IN DEFINITION?

Since 1955, the Chinese have not published a new set of criteria for defining urban population. It is possible that some revised definitions were proposed and accepted, and are now being used by the government without public announcement.[5] More likely, however, because of political instabilities, economic crises, and a variety of policies and developments which tend to confuse urban-rural distinctions, the precise demarcation of urban areas probably was simply not a priority issue for Beijing, and the task, therefore, was ignored for most of the past 25 years. Whether or not this assumption is correct, the changes in China's countryside are significant, and especially relevant to this discussion is the growth of nonagricultural employment in rural China.

Curiously, the diversification of rural employment was essentially an outgrowth of an emphasis on agriculture. The critical economic depression which followed the Great Leap Forward, prompted recognition that, before announcing any more grandiose plans for catching up with the West, Beijing had to make sure that China's agriculture would be able to feed a population which in the early 1960s was growing by some 15 million per year. With the designation of "agriculture as the foundation," the main target naturally was increased production, first requiring improvements in the basic management of water and land, and proceeding next to increased use of fertilizer, then to selective mechanization, and finally, in general, to the gradual introduction of more scientific skills and methods. It was this same priority on agriculture, combined with the drive for the "socialist transformation of the countryside," that made it possible to introduce policies and programs which could productively absorb in the rural area not only some of the excess urban population, but also most of the rural population growth. The result has been an accelerating change in the characteristics and composition of the labor force in the rural areas—a change that is directly pertinent to this discussion.

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[5] During a 1980 visit to China, Professor K. C. Tan of the University of Guelph (Ontario) was assured by his Chinese colleagues at the Geography Institute in Beijing that a 1963 urban definition designated all places with a population of over 3,000 and with not more than 25 percent in agriculture, as urban. Because of the inadequacy of statistics, however, Tan is skeptical about the application of this criterion in practice. He also writes that "it is believed the size of the urban population is deliberately deflated by using employment as a criterion rather than place of residence." (K. C. Tan, "The Four Modernizations and Chinese Urban Geography," paper presented at the Annual Meeting of the Canadian Association of Geographers, Corner Brook, Newfoundland, August 11, 1981, and private discussion.)

In response to both political campaigns and socioeconomic policies, many millions of urban professionals, technicians, and students were transferred for short, long, or permanent residence in the countryside. The volume of the outward movement (discussed in more detail in the next section) fluctuated over the years, peaking during and after the Cultural Revolution and ebbing since 1978. Not all of the urban migrants worked in the field, and their presence accelerated the significant increase in the numbers of people involved in public health, education, commerce, transportation, and other nonagricultural activities.

The other major phenomenon for change in the countryside was the creation of small rural industries. This program was initially introduced during the Great Leap Forward; in 1958 alone 40,000 new "industrial enterprises" were established and 20 million peasants reportedly became workers.[6] It succumbed, along with the rest of the Great Leap, to widespread mismanagement, "imbalances," and natural disasters. It was not long, however, before the drive for rural small-scale industries was initiated again. This time it followed the withdrawal of Soviet assistance in the early 1960s and was motivated by China's political and strategic goals of self-reliance and self-sufficiency, as well as practical considerations brought on by the need for economic frugality. Because they were the product of multiple considerations, rural small-scale industries have been increasing rapidly in number despite some ideological fluctations over the years. The emphasis on agriculture meant that there would be an increased demand for agricultural implements, irrigation equipment, energy, chemical fertilizers, pesticides, and construction materials, and the leadership concluded that a large share of these needs could be met by small production units, not only under county jurisdiction, but also operated by communes, production brigades, or even production teams. The small plants would use local raw materials, use the less sophisticated machinery and tools, relieve some of the burden from the inadequate transportation system, and supply local agriculture with many of the necessary inputs at a lower cost. Last but not least, rural small-scale industries were to "make it possible to keep people from flocking into the large cities."[7]

This is not the place to discuss the economic pros and cons of rural small-scale industries, or, for that matter, to worry about policies that have shifted over the past two decades. These issues have been thoroughly covered by many qualified observers from a variety of perspectives.[8] Here we are concerned primarily with whether we can identify, even in a very general way, the proportion of the rural labor force which is involved in nonagricultural activities—rural industries among them.

It is no surprise that the Chinese have not published any figures on the size of the rural nonagricultural labor force, and it is quite conceivable that such data do not exist even in China. Various figures and

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[6] Qunzhong Luncong" (Collected Essays of the Masses), September 1979, translated in JPRS (Joint Publications Research Service) 75533, April 21, 1980.

[7] Jingii yanjiu (Economic Research), hereafter JJYJ, No. 1, January 20, 1980, in JPRS 75608, May 1, 1980.

[8] For example see J. Sigurdson, "Rural Industrialization in China," Harvard University Press, 1977; The American Rural Small-Scale Industry Delegation, "Rural Small-Scale Industry in the People's Republic of China," University of California Press, 1977; J. Sigurdson, "Rural Industrialization in China: Approaches and Results," in Neville Maxwell, ed., "China's Road to Development", Pergamon Press, 1979, pp. 137–54.

percentages available on sectors of the labor force suffer from both statistical and definitional problems, which relate to both the numerators and the denominators. Even when the labor force category is clear, it is very common for it to include both the urban and rural segments (for example, health, education), calling for considerable ingenuity in splitting the total between town and village. There are the inevitable problems with regard to the inclusion or exclusion of part-time and seasonal workers, and it is not always clear whether factors were used to convert the labor of women and children into equivalent full-time units. According to the Rural Small-Scale Industry Delegation, for example, the labor force "varies considerably from place to place, hinging on how the local village accountants choose to reckon work points. . . ." [9] This would partly explain the delegation's finding that in the communes and brigades they visited, the proportion of the population in the labor force has an improbable range of 31 to 64 percent. The nature of the reported data explains why the imaginative estimates by Western specialists focus on nonagricultural employment, rather than attempt to split the labor force in a particular category between the countryside and the cities.[10]

A recent source did pull together some figures for the labor force employed by commune and brigade enterprises: [11]

Year	Number of enterprises	Number of full-time workers	Percent of total commune labor	Implied commune labor force
1976	1, 115, 000	17, 919, 000	6. 1	294, 000, 000
1977	1, 392, 000	23, 284, 000	7. 7	302, 000, 000
1978	1, 524, 000	28, 265, 000	9. 5	298, 000, 000
1979	1, 480, 000	30, 000, 000	9. 4	319, 000, 000

What are these full-time workers engaged in? "Over 90 percent of the communes and over 80 percent of the brigades have set up various kinds of industrial, mining, communications and transport, construction, and service enterprises and are vigorously developing plant growing an livestock breeding business." [12] In other words, at least some of their activities would fall under what might be considered nonagricultural pursuits. At the same time, "as modernization of agriculture progresses and a large number of the broad masses of peasants in our country will become a nonagricultural population, they cannot and must not enter existing large and medium-size cities." [13] While it is difficult to compare the figures of workers in commune- and brigade-run enterprises with some of the earlier estimates because of varying inclusions, it is nevertheless interesting to look at a few examples.

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[9] The American Rural Small-Scale Industry Delegation, op. cit., p. 113.

[10] See, for example, J. P. Emerson, "Nonagricultural Employment in Mainland China: 1949–1958," U.S. Department of Commerce, International Population Statistics Reports, Series P–90, no. 21, Washington, 1965; C. M. Hou, "Manpower, Employment and Unemployment," in A. Eckstein, W. Galenson, and T. C. Liu, eds., "Economic Trends in Communist China," Stanford University Press, 1971; T. C. Liu and K. C. Yeh, "The Economy of the Chinese Mainland," Princeton University Press, 1965; T. G. Rawski, "Industrialization, Technology and Employment in the People's Republic of China," World Bank, Staff Working Paper No. 291, Washington, 1978.

[11] Figures for 1976–78 are from a draft of a paper by Zeng Qixian, "The Problem of Employment in the Economic Development of China," presented at the US-China Conference on Alternative Strategies for Economic Development, Wingspread, November, 1980; the 1979 figures were reported by Xinhua, in Foreign Broadcast Information Service, "Daily Report: China" (hereafter FBIS), September 23, 1980.

[12] Xinhua, September 19, 1980, in FBIS, September 23, 1980.

[13] JJYJ, No. 11, November 20, 1979, in JPRS 75,408, March 31, 1980.

On the basis of research conducted in the early 1970s in Hebei Province, Jon Sigurdson estimated that in this province "not more than 2.6 percent of the labor force was employed in county and commune level local industrial enterprises." More significantly, he found that if all those whose employment is related to industrial activities are counted, "they would constitute 10 to 15 percent of the labor force of the county." [14] Although his is a model county, it should be kept in mind that Sigurdson's estimates were based on data gathered 8 to 10 years ago and that there has been considerable development in rural industries since then. A few years later, the already-mentioned Rural Small-Scale Industry Delegation found that the total labor force employed in industry in the counties and communes they visited ranged from 2 to 19 percent, concluding that the lower figures seemed more characteristic of nonurban employment in small industries in the nation as a whole.[15] Thomas Rawski estimated that the full-time industrial employment in rural areas in 1975 was 15 million, and judged it to be a "very generous estimate." [16] About the only thing that can really be concluded is that if the ball park is made large enough, everything is likely to fall in.

After this rather general discussion, what can be said about the size of China's overall rural nonagricultural employment? On balance, it would seem that the most recently reported figure of 30 million is a generous but reasonable estimate of the number of full-time workers employed in the broadly defined category of rural small-scale industries in 1980. An approximation based on some earlier estimates on nonagricultural employment and my own perceptions of rural developments, would place the number of workers in rural areas engaged full-time in public health, education, government and mass organizations, trade, communications et cetera at about 20 million. Combining the two figures we get a total employment in rural nonagricultural activities on the order of 50 million—an incredibly high figure except in China where it constitutes only about 15 percent of the rural labor force.[17]

In terms of China's criteria for urban and rural populations, the location of these 50 million is more important than the overall number. If the total were distributed evenly throughout the countryside, it would not be necessary even to raise the question—50 million can be submerged easily in a rural population of well over 800 million. But it is clear from everything we know about the Chinese countryside that this is not the case. The density of nonagricultural employment is greatest around cities—and the larger the city, the larger the circle in which such employment is most evident. The city creates a need for goods that can be produced in small industries and there are likely to be transportation facilities to get these goods to the appropriate market. Proximity to cities is likely to be reflected in greater availability of managerial and technical skills for small industries. Characteristically cities develop in areas that are already rich in agricultural lands, which means that the rural communities in these regions would also be relatively well off. Consequently, they would not only have the capital and human resources to develop a variety of subsidiary production activities, but their well-being would also be reflected in better-staffed schools and public health facilities and a greater number of people involved in administration, trade, communications, and other nonagricultural activities. Even in agriculturally poor areas, cities, which depend on other types of resources for their economy, have an economically beneficial effect on the surrounding countryside—albeit, the radius of the circle is not likely to be as large.

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[14] Sigurdson, "Rural Industrialization in China", p. 51. For all his estimate Sigurdson assumes that the labor force constitutes 40 percent of the population.

[15] The American Rural Small-Scale Industry Delegation, op. cit., p. 214.

[16] Rawski, op. cit., p. 42.

[17] For a detailed analysis of the rural labor force, see J. P. Emerson's chapter in this volume (unavailable as of this writing).

The conclusion seems to be that there are communities both inside and outside municipal boundaries where over half of the full-time labor force is engaged in nonagricultural activities. The following description of a commune center outside Weihai City in Shandong Province may not be typical, but is still illustrative of the problem at hand:

> The center has a population of 4,000. Its 20-meter wide streets are lined by 11 commune-run enterprises, including a fish processing plant, a fishing net factory, and a tractor repair plant, which employ a total of 1,600 people. The commune center has middle and primary schools, stores, a clinic, a supply and marketing cooperative, and a credit cooperative. There are also a hotel, a restaurant, a public bath, a cinema, a day-care center, and a kindergarten.[18]

In other words, the commune center has all the characteristics of a small town—an urban area. But would it be included in the urban population? Almost surely it would not. It is, after all, part of a rural commune and many of the workers are likely to live in adjacent villages. If, however, this center is part of the Weihai Municipality, as it seems to be, it could be included, along with the rest of the rural population under municipal control, under the broader urban definition.

There are probably thousands of communities similar to the one just described. They are most often referred to by the Chinese as "rural towns"—a term which is at the same time descriptive and contradictory. This may not have constituted a problem in the past, but since the rich and more diversified communes are likely to become still richer, still more diversified, and with still larger "rural towns" as their centers, it may become a problem with which the authorities will be forced to grapple. It will be interesting to see if the State Statistical Bureau will be publishing some more precise general criteria for the urban and rural populations before the 1982 census and if some special provisions will be made to distinguish rural settlements in which most of the people rely on nonagricultural activities for their livelihood. It may not be an easy directive for the SSB to draw up.

TRENDS IN URBAN MIGRATION

Neither Mao's idealistic and somewhat sentimental notion of gradually erasing the differences between the city and the countryside, nor the increased resources that have been going into agriculture, have changed the attraction that cities hold for the rural population. And the story of China's urbanization over the past 30 years must focus on the almost perpetual movement of vast numbers of people entering and leaving the cities. There may be confusion about the definition of "urban" and an absence of precise figures on the size of the urban population, but there has been information at least on the trends in the ebb and flow of migrants. Let us review some of the shifting policies which directly or indirectly have been affecting the two-way migration between village and town.

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[18] Xinhua, July 10, 1979, in JPRS 73955, August 3, 1979.

Two complementary forces—the "pull" and the "push"—acted in unison to accelerate urban migration after the establishment of the new government in 1949. Not surprisingly, the announced plans for rapid industrial development caused millions of peasants—mostly young males—to enter the cities in what was described as a "blind infiltration." Prospects for economic opportunities appeared to be unlimited and the family which remained in the village stood to benefit from any success that the migrant might achieve. The "push" factor was just as important in causing people to leave the countryside. The progression from land reform in the early 1950s, to the creation of agricultural producers cooperatives in 1955, and finally to rural communes, resulted in serious social and economic dislocations, causing people to move from the land.

Beginning in 1953 there were constant directives and exhortations to control the influx of peasants and to "dissuade farmers from pouring blindly into the cities." To no avail. The search for opportunities in the cities and the desire to escape the crises of the countryside, resulted in an incredibly rapid growth in urban population, from about 58 million in 1949 to nearly 100 million in 1958. The growth rates of some of the largest cities were representative of the nation at large. In 1956 the population of Shanghai increased by nearly 500,000 in just six months;[19] in the same year the population of Beijing increased by 300,000;[20] and Wuhan reported that in 1957 that city's "temporary and floating population" stood at 220,000.[21] The results were predictable. There were shortages of housing, food supplies, public utilities, and all other services. Most important, millions of unskilled and illiterate peasants were unable to find jobs, and in 1957 over half of the urban population was reported to have been "unproductive."

Since the various controls over unauthorized migration were obviously failing and since numerous provinces were reporting labor shortages in agriculture due to the departure of so many able-bodied men, the leadership launched a drive to "mobilize urban superfluous workers to return to their home villages to take part in production in support of socialist agricultural construction." In 1956, and especially in 1957, literally millions of people were rounded up (assuming no one volunteered) and sent back to the village. Even graduates from urban primary and secondary schools, who would not continue their education, were mobilized "to march to their work posts" in their native villages. As successful as this drive appeared to be, however, the net result was not to reduce the size of the urban population, but rather to keep it from growing as fast as it would have lacking this tactic. In fact, it has recently been reported that in the 8 years between 1949 and 1957, there was a net in-migration of 18.5 million people into the urban areas.[22]

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[19] Chieh-fang Jih-pao (Liberation Daily), December 26, 1956, translated in Survey of China Mainland Press (hereinafter SCMP), no. 1513.

[20] Xinhua, December 5, 1956.

[21] Chang-chiang Jih-pao (Chang-jiang Daily), February 27, 1958, in SCMP, no. 1764.

And then came the Great Leap Forward. In 1958 and 1959 the general line was that both industrial and agricultural production could be increased by throwing additional manpower—"steeped in revolutionary enthusiasm"—into all types of activities. The creation of people's communes in the countryside and the drive to accelerate urban industrialization (to catch up and overtake Western countries) caused a new wave of migrants to flood the cities, many of them actually recruited by urban industries. Not only did the urban population peak to a reported 130 million in 1960 (a figure discussed in the next section), but serious labor shortages appeared on the agricultural front. According to one source, between 1958 and 1960 the number of laborers engaged in grain production was reduced by 40 million—although, of course, not all of them left for the cities.[23]

The collapse of the Great Leap and ensuing natural calamities forced a complete revision of China's economic policies and the most drastic effort to date to expel the excess urban population—a process that was facilitated by the deep economic depression. Many industrial enterprises were forced to close, some because of a shortage of raw materials from agriculture and others because they were designated as uneconomic. Twenty million newly recruited urban laborers were again relocated in the villages [24]—and since at least some of them must have had family members that went along, the total out-migration might well have reached 25 million.

Starting with 1960 and for at least the next 15 years, there was virtually a complete blackout on the size of China's urban population; but the general trends are reasonably clear. By 1962, and certainly by 1963, China began to recover from the economic depression and despite Beijing's plea that "the labor necessary for the cities should be drawn primarily from the labor resources in the cities," the workers who had been forced to return to the countryside during the previous few years began to drift back into the cities. Urban population started to grow again. The growth rate was certainly slower than it was in the 1950s, but only because the authorities conducted a perpetual battle against unplanned migration. The allocation of greater resources to the rural sector probably helped a little in keeping people in the countryside, but the primary reliance was on a variety of policies and directives to implement controls on urban migration. Anyone wishing to move to the city had to get permission from his brigade or commune to leave, which might not have been too difficult, at least in those localities which had a surplus of manpower. But a more troublesome requirement called for written proof that either a job or a slot in an educational institution was waiting for him in the city. Nevertheless, legally or illegally, young people managed to overcome all the hurdles and the simultaneous flow of people into the cities and forced evacuations out of the cities continued until the Cultural Revolution.

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[22] Zhang Zehou and Chen Yuguang. "The Relationship Between Population Structure and Economic Development in China." Zhongguo Shehui Kexue (Social Sciences in China), no. 4, July 10, 1981, pp. 29–46. (Translated by Florence Yuan, FDAD).

[23] Zeng Qixian, op. cit.

[24] Ibid.

During the first few years of the Cultural Revolution, the country was much too preoccupied with politics to be concerned about urban migrants. Thus, a significant proportion of the many millions of Red Guards who flooded Chinese cities and demonstrated in Tiananmen Square came from rural areas. But in 1968, yet another national effort was mounted to "persuade" the Red Guards and other "young intellectuals" to leave the cities and "make revolution" in the countryside (discussed in more detail below). Many of the Red Guards took advantage of the confusion to "disappear" in the cities, so that the rounding up of these undisciplined youths became a lengthy and difficult process. The anti-urban, anti-intellectual biases of the late 1960s and early 1970s expanded the forced migration from the cities to include the removal of excess manpower from the factories, the reduction of the bureaucracy, and the transfer of medical and other personnel to the villages. The deportation of all these people was to serve three basic purposes: relieve the population pressure in the urban areas, accelerate the development of the countryside, and help everyone involved with their ideological reeducation.

Throughout the late 1960s and early 1970s we read only about the exodus from the cities; we could only surmise that there were also people moving in the opposite direction. Recently, however, an article in "China Reconstructs" revealed some fascinating figures on the volume of the two-way migration. Between 1966 and 1976, 13 million school graduates from the cities were sent to work in the countryside, while "at the same time through various channels the same number of country people came into the cities and were assigned work." [25] The fascination with these new figures was quickly dispelled by a 1981 article in a social science journal, which reported that between 1966 and 1976 (identical dates) the number of out-migrants exceeded the number of in-migrants by more than 5 million and that consequently "the increase of the urban population during this period was entirely due to natural increase." [26] Yet another source gives figures that are somewhere in the middle. In a conference paper, a Chinese economist writes that although 16 million educated youths were sent to the countryside during this same 11-year period, 14 million peasants were recruited by cities and towns to work in state-owned enterprises and institutions. He also points out, incidentally, that "these large two-way flows of laborers between urban and rural areas resulted in a great deal of wasted manpower, material, and financial resources." [27] It would be completely unrealistic to expect China to have figures on net urban migration for such a chaotic decade. Chinese authorities and scholars are making their own estimates and coming up with somewhat different answers, all of which confirm the general trends in migration but are of no value in estimating annual changes in urban population.

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[25] "China Reconstructs", No. 2, February 1981.
[26] Zhang Zehou, op. cit.
[27] Zeng Qixian, op. cit.

RUSTICATION OF YOUTH

Any discussion of urban migration in China cannot be complete without at least a review of the xiafang movement—the "sending down" of young urban "intellectuals" for permanent or temporary residence in nearby villages or distant provinces. Mao believed that in the countryside there was "plenty of room to develop their talents to the full" and that a lifelong resettlement would benefit both the individual youth and the nation. As a consequence, China initiated what has been called the largest forced migration in history, which, with greater or lesser intensity, has been going on for over 20 years.

The slogan "up to the mountains and down to the countryside" was used briefly to deport youths from the cities in the 1950s and revived in the early and mid 1960s; the movement peaked between 1968 and 1976. Although it is now admitted that the youth resettlement program was "overdone" and "abnormal" and although a stint in the village is no longer a prerequisite for admission to a university or a job in a factory or office, the rustication movement continues still, though at a more modest rate. There is finally official admission that the main reason for moving young people out of the cities was and continues to be to relieve the pressure on urban employment. Naturally, the practice of sending graduates of urban schools to face the harsh living and working conditions in the countryside—made worse by the belligerence and prejudice of local inhabitants—has been extremely unpopular with the youths and their parents. It has survived only through continuous political and economic insistence (and sometimes coercion) exerted at every bureaucratic pressure point. The compromise which is currently being tried sends urban youths not to the production teams of the people's communes, but to "collectively owned farms especially set up for them." In 1979, it was officially estimated that 1 million of the 3 million urban middle school students who graduate every year will settle on these collective farms, where they will be able to maintain "the same living standard as in the cities."[28]

Western scholars have written many excellent studies about China's rustication movement[29] and, indeed, much can be said about the political, social, and economic factors and consequences associated with the xiafang movement. Here, however, we are again concerned primarily with numbers; and specifically with the effect rustication may have had on controlling the size of the urban population.

Throughout the 1960s and most of the 1970s there have been literally thousands of reports glorifying the patriotic youths who "volunteered" to serve the revolution in the countryside. But how permanent was this move? There were youths who were expected to "strike roots" in the countryside and remain there permanently and millions of others who were sent down for shorter periods to perform manual labor or in other ways to participate in basic production. Pi-chao Chen makes a strong argument for clearly distinguishing between xiafang and xiaxiang.[30] Quite rightly he states that "xiafang" refers primarily to government and party cadres, teachers, students, and other intellectuals who were sent down for a "tour of duty" in the countryside or other basic level units, but who then returned to their original posts. Xiaxiang, on the other hand, refers to people, for the most part urban school graduates and other youths, who were expected to settle down in the rural village for life. Unfortunately, this distinction is not always made clear and the terms are used interchangeably not only in translation (which can be expected) but even in Chinese usage. Perhaps the reason for this lack of precision is that neither the youths nor their parents wanted to believe that the transfer would be permanent and refused to apply the official xiaxiang to the departure of their son or daughter. And indeed, many of the educated youths did not stay. Through their own efforts, the efforts of their parents, and taking advantage of any opportunity provided by local or national events, they tried, and sometimes succeeded, in returning to the urban areas. In the case of many individuals, the process was repeated several times.

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[28] Beijing Review (hereafter BR), No. 47, November 23, 1979.

[29] See, for example, T. P. Bernstein, "Up to the Mountains and Down to the Villages", Yale University Press, 1977; P. C. Chen, "Overurbanization, Rustication of Urban-Educated Youths, and Politics of Rural Transformation," "Comparative Politics," April 1972; P. H. Chang, "China's Rustication Movement," "Current History," September 1975.

Understandably, then, the number of young people who have been permanently moved out of the cities over the past two decades can only be approximated. Over the years Western estimates have ranged from 10 to 15 million to as high as 20 and 25 million. A review of the Chinese sources over the course of these many years argues for the higher figures, but this would not allow for the youths who return to the cities and those who were double-counted because they were "sent down" several times. Assuming a degree of credibility in some of the more recently reported figures, we can derive an estimate that falls somewhere between the extremes mentioned above. There are three reported components in the estimate. In 1976 Peking Review reported that "In the decade prior to the start of the Great Proletarian Cultural Revolution, only some 1.2 million educated youth had settled in the countryside." [31] The same source states. "Twelve million school graduates have gone to live in the countryside since the start of the Great Proletarian Cultural Revolution in 1966." Since both figures are retrospective, it is quite likely that they are net figures—youths who remained in the countryside, rather than a summation of those who were "sent down." Thus, 13.2 million settled in the countryside between 1956 and 1976. Further, if we accept the statement that of the annual 3 million middle school graduates. "about 1 million will settle in the countryside," [32] and assume that this is a reasonable figure for the 1976–80 period, we have to add another 5 million, raising the total to 18.2 million. Is this, then, the final estimate of the number of youths sent to the countryside? No. When dealing with Chinese statistics, at the end of each analytical process it is necessary to inject intuition—otherwise referred to as experience. The 18.2 million figure seems too high. The problem may be in the original data, in the reasoning behind the estimate, in the continuous legal or illegal flow of urban youths back to the cities, or, yes, even in the intuition. In any case I would suggest that the total number of urban youth who have settled in the countryside in the past 23 years is more likely to be in the 10 to 12 million range.[33]

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[30] P. C. Chen, op. cit., p. 365.
[31] BR, No. 2, January 9, 1976.
[32] BR, No. 47, November 23, 1979.

In view of the publicity the rustication movement has been receiving in and out of China, the transfer of 10 to 12 million youths over a span of some 25 years may not appear to be too impressive—but it is. First, if these figures are at all realistic, they represent approximately 10 percent of the urban population. And second, the impact of transfering these fertile youths to the countryside is considerably increased by the fact that their progeny will not be born in the cities. On balance, there is no denying that the rustication of youth has been an important policy in controlling the size of China's urban population.

SIZE AND DISTRIBUTION OF URBAN POPULATION

We don't know the size of China's urban population. Scattered figures and indirect references in Chinese publications are loosely used and often contradictory. Nor can we estimate China's urban population. Knowing about the enormous movements to and from the cities, and having some ideas of the trends in urban natural increase, are useless because we lack a solid base and the detailed statistics required to produce annual increments. Neither does it help to know that "China now has 191 cities of various sizes at the municipal level . . . 3,200 towns, including 2,000 county towns, each with a population of from 10,000 to 50,000 and a still greater number of townships."[34] There is still no clear-cut definition of "urban" and there is still obvious confusion between the "urban population" and the population under the jurisdiction of the municipal urban authorities. The potential for further confusion has been compounded by the increase in the proportion of the rural population engaged in nonagricultural activities and the creation of the anomalous, neither fish nor fowl, "rural towns." Thus, several points need to be made with regard to this section. No one can resolve the problems inherent in China's urban population statistics and it would be presumptuous to imply otherwise. The data presented are not definitive but rather are illustrative of the many problems which have already been discussed. The Chinese say that "skin transplants will not help raise the people's intellectual standards"; likewise, the most erudite analyses cannot improve on the inadequacies of China's population data. What follows, then, is an admittedly skeptical discussion of the data and of the anomalies, interspersed with some speculation and guesses.

The data for the 1950s are, by now, quite familiar and we need not spend much time reviewing them. The 1953 census reported a spuriously precise urban population of 77,257,282, or 13.26 percent of the total population; and, incidentally, both the absolute figure and the percentage are probably the lowest that have been used in this century.

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[33] The November 23, 1979, Beijing Review article refers to "5 million city youths who have settled in the communes." Since the article deals with the eventual transfer of rusticated youths to the special collective farms established especially for them, the 5 million figure probably does not include the early transferees who by now would be considerably older and adequately integrated in their village.

[34] Xinhua, March 14, 1980, in FBIS, March 14, 1980.

The only urban population series published by Beijing appeared in a 1957 statistical journal[35] and contained the following figures for urban population and the percentage they constitute of the total population:

	Number	Percent
1949	57, 650, 000	10. 60
1950	61, 690, 000	11. 12
1951	66, 320, 000	11. 78
1952	71, 630, 000	12. 46
1953	77, 670, 000	13. 31
1954	81, 550, 000	13. 55
1955	82, 850, 000	13. 48
1956	89, 150, 000	14. 20

The figures look reasonable enough, but the accompanying text raises some questions about their accuracy. Most of these estimates were derived by working backward and forward from the 1953 census figure and were based on reports from relatively small and unrepresentative sample areas of China. Besides, neither the statistical establishment, nor even the security people could keep track of the millions of migrants who were moving in and out of the cities in those years.

The reported urban population figures for 1957 usually fell in the 95 to 99 million range and were then followed by an incredible jump during the Great Leap. Typical for the period was a People's Daily editorial which stated that "during the last three years the population of cities and industrial and mining centers has increased by about 20 million."[36] There were even several reports indicating that by the end of the Great Leap period the urban population reached 130 million. A sharp spurt in urban population at the end of the 1950s is not in question, but the migration implied in the above figures is difficult to subscribe to. Even before the Great Leap Chinese cities were having serious problems wrestling with the influx of people; the authorities could not possibly have coped with housing, feeding, and providing employment for 20 million or more unskilled peasant migrants.

Assuming that the high urban population reports for 1959 and 1960 were not entirely fictitious, two suggestions can be made to explain these numbers. The actual migration into the cities, combined with the urban natural increase, may have indeed accounted for a significant proportion of the urban growth between 1957 and 1960, but the remainder of the increase must have been due to reclassification actions taken by the authorities. During the Great Leap Forward there was an enormous increase in capital for the industrial sector and much of the industrial expansion took place outside the boundaries of the core cities. Because of this, as well as the desire of cities to become self-sufficient in some of the basic food supplies, Beijing authorized many of the municipalities to extend their jurisdiction over adjacent counties—a process which has continued since then. This redrawing of urban boundaries had an obvious effect on the size of the urban population.[37]

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[35] T'ung-chi Kung-tso (Statistical Bulletin), No. 11, June 14, 1957, translated in Extracts from China Mainland Magazines, No. 91, July 22, 1957.

[36] Jen-min Jih-pao (People's Daily), August 25, 1960, as quoted in China News Analysis, No. 526, July 24, 1964, p. 5

[37] See, for example, K. Fung, "Satellite Town Development in the Shanghai City Region," Town Planning Review, No. 1, January 1981.

The second type of reclassification related to workers and employees whose numbers increased by more than 20 million between the end of 1957 and the end of 1958.[38] Even if the economy could have accommodated such an increase in only one year (and it could not), China did not have 20 million skilled individuals just hanging around waiting to become workers and be absorbed into the urban labor force. Most likely, therefore, the "20 million peasants who became workers" in 1958 were not all peasants; millions of them were probably urban and rural handicraftsmen and perhaps personnel in service occupations, converted to "workers" by their transfer to the State budget.

From this probability we reach for still another. Earlier we discussed China's redefining of "urban": the occupational composition of the labor force was declared a factor to be considered in determining whether a locality would be classified as "urban." Assuming that some effort was made to comply with the new definition standards, the reclassification to "workers" of large segments of the suburban and rural working population could also have resulted in the area's reclassification to "urban"—without any shift in population.

As noted above, the collapse of the Great Leap created a condition in which every extra person in the city was said to be a burden on agriculture and millions of people were evacuated to the rural areas. The urban population was "appropriately reduced," but we have no idea what an appropriate reduction might be. While urban population undoubtedly resumed its growth in the mid-1960s, not a single statistic (as opposed to vague generalizations) on the size of China's urban population could be found until some new and sometimes curious references began to appear in the late 1970s.

CURRENT DATA AND DILEMMAS

For over a dozen years, the most common statements encountered in Chinese sources referred to "the 80 percent of the Chinese population which lives in rural areas," or a variation of the same statement, "there are 800 million people in China and of these about 600 million live in rural areas." Experience suggests that such figures are of no more credence than the 600, 700 or 800 million figures which were used for China's total population. Nevertheless, after prolonged exposure to these statements, and remembering that China's urban population was already well over 100 million in the late 1950s, there was a tendency to conclude that indeed 20 years later it must be somewhere between 15 and 20 percent of the country's total population—perhaps in the 150 to 200 million range. Furthermore, simply by applying a modest urban natural increase to the 1953 urban population, and even completely disregarding migration, a figure close to 150 million can be reached for China's cities and towns in 1978.[39] It was therefore a bit of a shock when the Chinese first cited a 1978 urban population figure of 110 million. The thought that it was perhaps a typographical error was soon dispelled when other Chinese sources began citing the same figure.

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[38] "Ten Great Years," Peking, 1960, p. 180.

[39] Urban natural increase rates for ten years were presented in a paper by Liu Zheng, "The Present Situation and the Development of China's Population," at the Beijing International Round-Table Conference on Demography in October 1980. The figure of 150 million for the urban population can be derived by using these data and interpolating the growth rates for the missing 14 years.

To get a sense of the type of data we have to juggle, let us simply quote some of the recent statements that deal with urban population:

"China's urban population last year was more than 110 million as against a little over 50 million in 1949. . . ."[40] For the record, it was officially reported at 57.7 million in 1949.

"The population of cities and towns throughout the country . . . rose to over 110 million in 1978. . . . The proportion of urban population in the total population . . . rose to 15.2 percent in 1978."[41] Whereas the year-end 1978 population of the country was reported at 958 million, the above figures imply a total population of 724 million; even if we assume that "over 110 million" is 115 million, the implied total is raised only to 757 million. Conversely, 15.2 percent of the 1978 total population would produce an urban population of 145.6 million.

"The number of deposit accounts opened with the People's Bank of China surpasses 120 million, which approaches the size of the urban population."[42] It should be noted that in characteristic Chinese parlance, the "over 110 million" and "approaches 120 million" are, for all practical purposes, identical figures.

"The city population of our country has increased by nearly 65 million in about 30 years . . ." and in 1978, it constituted 12.51 percent of the total population.[43] Adding 65 million to the reported 1949 urban population of 57.7 million, we get 122.7 million. In fact, the author probably used the rounded 55 million for the 1949 urban population, and by adding 65 million obtained 120 million, which is exactly 12.51 percent of 958 million—1978 year-end population.

The mission from the World Bank, which visited China in late 1980, was informed that in 1979 China had 85.87 million people living in cities and another 42.75 million living in towns, for a total of 128,620,000.[44] One would assume, but only assume, that this figure, which represents 13.2 percent of the end of 1979 total population, is the most authoritative of the lot.

"Over the past 20 years the country's population increased by 300 million people and the nonagricultural population increased by 40 million."[45] From the context it is clear that the figures refer to the 20 years between 1957 and 1977. If we accept the reported end of 1956 urban population of 89 million, the implied end of 1976 "nonagricultural population" was 129 million. Is this synonymous with urban population? Sometimes.

"There are now approximately 8.25 million elementary school students in the cities of our country," and in the next paragraph, ". . . in our cities there are now 107 students of the elementary

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[40] Xinhua, August 21, 1979, in FBIS, August 21, 1979.

[41] Hongqi (Red Flag), No. 2, January 16, 1980, in JPRS 75317, March 3, 1980; also appeared in People's Daily, August 21, 1979.

[42] Xinhua, January 30, 1981, in FBIS, February 3, 1981.

[43] Huadong Shifan Daxue Xuebao (Journal of East China Normal University), No. 5, October 25, 1980, in JPRS 77764, April 7, 1981.

[44] Personal communication.

[45] Jingji Guanli (Economic Management), No. 7, July 15, 1980, in JPRS 76462, September 22, 1980.

> school age among every 1,000 residents."[46] From these two figures we can derive an urban population of 77.1 million—just below the 1953 census total. Incidentally, nowhere in this lengthy article on age composition in urban China do the authors cite an absolute figure for urban population.
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> "China's rural population amounts to 82 percent of her total population."[47] Assuming that the total population refers to the end of 1979, this statement implies an urban—or perhaps non-rural—population of 175 million.
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> "Because purchasing prices for grain and edible oil rose this year while their selling prices remained unchanged, the state subsidy to urban residents increased to 6.8 billion yuan, averaging 35 yuan a year for each resident."[48] This averages out to an urban population of 194.3 million, or 20 percent of the year-end 1979 population of 970,920,000.
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> "The Chinese press has admitted, for example, that 35 percent of the urban population of 195 million lives in inadequate housing. . . ."[49] Most likely even the experienced Fox Butterfield did not have a "deep throat" to turn to for his urban population; his figure is once again the product of 970.9 million and 20 percent.

These examples illustrate fairly the range of urban figures available for our consideration.

The quandary over urban population was further accentuated by conference papers presented in late 1980 by two Chinese demographers at two different conferences, in which they included vital rates for selected years for urban, rural, and total populations.[50] Surely neither of them anticipated that these figures, in part meant to illustrate the country's achievements in health and family planning, would be "misused" to set up equations in order to obtain the breakdown between China's urban and rural populations.

A detailed discussion of all the calculations and the resulting anomalies would be fascinating—but only to a very few of us. Suffice it to say that the urban, rural, and total vital rates presented in these papers for scattered years prior to 1971 were, for the most part, unusable, either because of probable errors in the typed manuscript or because of excessive rounding, which can grossly distort the derived results. Even the few figures that did emerge from "successful" equations made little sense in relation to other reported data. For example, for 1957 Ling's vital rates produced an urban population of 10.5 percent or 67.6 million, while four years earlier the 1953 census reported an urban population of 13.3 percent, or 77.3 million.

More interesting are the results of calculations based on the more complete vital rates for the 1971–79 period. Despite some minor differences in the decimal points, it is quite evident that for the whole period both authors, independently, used an unchanging proportion for the urban population—probably about 11.6 or 11.7 percent of the total population. Since it is obvious that the urban proportion of the population could not remain constant over all these years, the use of a constant figure once again proves (at least to me) that Chinese demographers—and I would say the Chinese Government—do not have precise statistics on urban population and do not hesitate to use approximations, especially when combined with other demographic indexes. Under the circumstances, there seems to be little significance in the urban proportions derived from the Liu and Ling data, except to note the curiously low totals they imply—ranging from 98.3 million in 1971 to 111.1 million in 1978.

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[46] Renkou Yanjiu (Population Research), No. 3, October 1980, in JPRS 77764, April 7, 1981.

[47] Zeng Qixian, op. cit.

[48] Xinhua, November 5, 1979.

[49] Fox Butterfield in The New York Times, January 20, 1980.

[50] Liu Zheng, "The Present Situation and the Development of China's Population," October 1980, a paper presented at the Beijing International Round Table Conference on Demography; and Ling Rui-zhu, "A Brief Account of 30 Years' Mortality of Chinese Population," December 1980, a paper presented at the Wingspread Conference on Chinese Economy.

Finally, some "official-looking" urban population figures were included in a 1981 issue of a social science journal: 1957–99.0 million (15.4 percent); 1960—130.73 million (19.8 percent); 1965—101.70 million (14.0 percent); 1970—102.30 million (12.4 percent); 1975—111.70 million (12.1 percent); and 1980—128.862 million (13.2 percent).[51] The figures once again seem to suggest that the "more official" estimates for the most recent years fall close to 130 million.

Is there any rationale, then, for urban population totals which fall in the 175 to 200 million range? Clearly, the largest share of the difference must be attributed to the definitions used in determining the urban population, and especially the populations of the more than 200 large cities—the municipalities (see table 1). These problems were discussed in an earlier section, but a few examples would again be illustrative of the variety of considerations that the Chinese must take into account in defining "urban."

First, of course, there are Shanghai, Beijing, and Tianjin, China's largest and most important municipalities, which are administratively equivalent to provinces and therefore referred to as independent municipalities. They cover large areas and in each case the "city population" constitutes approximately half of the total population of the municipality. In contrast, there are municipalities like Zaozhuang in Shandong Province, which encompasses a large mining district and has a city population of less than 10 percent. And there is Liupanshui Municipality in Guizhou Province which has a population of nearly 300,000 "scattered over more than 50 urban clusters, with one cluster being several kilometers, dozens of kilometers, or even 200 kilometers from another." Not only are factories, plants, workshops and various other facilities widely scattered, but "the living quarters of workers and staff are mixed with peasant households, strongly inconveniencing both production and livelihood."[52] The blame for this situation was placed on people with "left-deviationist ideas," who regarded urban construction as "practicing revisionism." But what might the "real urban" population of Liupanshui Municipality be?

Or take the following example, which is, perhaps, not quite as untidy. The source states that Weihai City in Shandong Province has a population of 190,000 but goes on to say that of this total only 30.000 live in the city and the rest are engaged in farming on the outskirts.

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[51] Zhang Zehou, op. cit.
[52] Xinhua, October 15, 1980, in FBIS, October 17, 1980.

TABLE 1.—CHINESE MUNICIPALITIES WITH OVER 500,000 POPULATION

Name of municipality	City population	Date reported	Total municipality population	Date reported	Number of counties
Shanghai	7.0	October 1979	12.0	February 1981	1
Beijing	5.3	June 1981	8.8	June 1981	9
Tianjin	4.9	July 1980	7.4	July 1980	5
Chongqing	2.4	August 1979	6.2	November 1979	4
Guangzhou	2.9	February 1980	5.4	December 1979	6
Hangzhou	1.1	December 1979	5.0	November 1977	7
Changchun	1.6	December 1979	5.0		5
Shenyang	2.7	April 1981	4.7	April 1981	2
Chengdu	1.2	October 1980	4.0	May 1979	2
Dalian	1.0		4.0	April 1975	5
Harbin	2.1	March 1980	4.0		0
Jinzhou	.4	October 1958	3.8	June 1970	7
Wuhan	2.2	August 1978	3.8	December 1979	0
Nanjing	1.3	March 1973	3.6	December 1979	3
Jinan	1.1	June 1966	3.2	December 1979	3
Dandong	.3	March 1974	3.0		4
Xian	2.0	December 1979	2.8	December 1979	1
Changsha	.8	July 1973	2.6	December 1979	2
Anshan	1.1	January 1980	2.5	February 1961	2
Fuzhou	1.0	December 1979	2.5		1
Nanchang	1.0	December 1979	2.4	December 1979	2
Lanzhou	1.1	December 1979	2.3	December 1979	3
Jilin	.7	August 1979	2.2	April 1975	5
Baotou	.9	May 1978	2.0		2
Yingkou	.3	February 1975	2.0		4
Kunming	1.0	December 1979	1.9	December 1979	4
Taiyuan	1.0	April 1977	1.8	April 1977	3
Fushun	.9	July 1973	1.8	April 1976	3
Fuxin	.5	November 1961	1.6		2
Zigong	.3	Arpil 1959	1.5	June 1979	0
Hefei	.7	December 1979	1.5	December 1979	1
Qingdao	.9	November 1979	1.4	September 1968	4
Liaoyang	.5		1.3	October 1969	0
Zhengzhou	.8	November 1977	1.3	December 1979	1
Guiyang	.8	September 1977	1.3	December 1979	0
Benxi	.8		1.2	June 1970	2
Tangshan	.7	December 1979	1.2	October 1980	0
Urumqi	.8	January 1981	1.2		1
Luoyang	.9		1.1	November 1978	0
Shijiazhuang	.5	November 1959	1.0	December 1979	0
Zhangjiakou	.6		1.0	December 1974	0
Qiqihar	.9		1.0	June 1972	0
Wuxi	.4	October 1979	1.0	October 1973	0
Hohhot	.4	August 1977	1.0	July 1978	2
Ningbo	.6		.9	November 1980	0
Xining	.5	September 1979	.9	December 1979	1
Suchou	.5	November 1973	.9		0
Dukou	.3	April 1979	.8	April 1979	2
Xuzhou	.5	March 1968	.8		0
Daqing	.2		.7	May 1980	0
Yinchuan	.2	December 1979	.6	December 1979	2
Nanning	.5	December 1978	.6	December 1979	0
Huainan	.2		.5	March 1958	1
Maanshan	.2	April 1973	.5	March 1968	0
Xiangtan	.3	February 1980	.5	February 1980	0

Note: This table was prepared by Ly Burnham, research analyst at the Library of Congress. Entries which have no reported date are estimated figures.

But are all the rural people actually "engaged in farming" as the source states? No. The article goes on to talk about "1,000 peasant workers" employed in nineteen carpet-weaving centers; it mentions 8,867 "peasant-workers" working in 287 rural processing centers; in addition, "there were 58 commune-run and 156 brigade-run factories in the city's seven rural people's communes."[53] Can we assume that in this instance Weihai contributed 30,000 people to China's total urban population? 190,000? Something in between?

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[53] BR, No. 22, June 2, 1980.

The problem is even more vividly illustrated in the Fengfeng mining area in Handan Municipality, which is described as "a place in a semiurban, semirural area where peasants and urban residents live together," so that the social situation is "comparatively complicated."[54] Indeed!

Since by now the reader's normal perceptions of urban population must be reduced to a rather fuzzy silhouette, it is tempting to suggest some personal and impressionistic estimates: that as of the end of 1980 China's urban population was approximately 135 million, constituting 13.7 percent of the total population of 982,550,000; that such an estimate is likely to be consistent with the 1955 State Council directive, which stated that "all the closely adjacent suburban residential areas that are contiguous to the municipality should be classified as urban regardless of the proportion of the agricultural population"; and that the inclusion of all the rural population under the jurisdiction of the municipalities would raise the total to about 175 million, or 17.8 percent of the population—an "urban" figure which is more consistent with the higher reports. Based on the preceding discussion, however, such statements would be most presumptuous. If Beijing has had difficulty defining "urban" and has been unable to institute a standard reporting system for the various localities, on what basis can one possibly estimate China's urban population? It is best to leave well enough alone.

DISTRIBUTION OF URBAN POPULATION

Since it is a bit ludicrous to distribute unknowns, until now China has never published a provincial breakdown of the urban population. The spatial distribution of the cities and towns has not been a mystery, however; they grew where they would have been expected to grow, in the most densely populated areas of China's most fertile coastal provinces. As China started, at the turn of this century, its slow transition from agriculture and handicrafts to the more modern industry and commerce, the existing cities—especially the ports, which became major transshipment centers—accelerated their growth. In other words, the disproportional concentration of cities in the eastern segment of the country had little to do with "foreign imperialists and domestic bureaucrat-capitalists," whom the Chinese are now prone to accuse; foreign imperialists undoubtedly exploited China, but they did not change the naturally evolving pattern of urban development.

Since 1949, most of the efforts to estimate the provincial distribution of urban population started with the summation of the available population figures for individual urban localities—for the most part, cities of over 100,000. Since most of these figures were approximations and the assembled data were never complete, the results were less than satisfactory, with considerable discrepancies from estimate to estimate. There were, however, some general facts which were not in dispute. The concentration of most of the urban population in the eastern segment of the country was, indeed, not in question. There was no doubt that the formerly Japanese-occupied northeastern provinces (Liaoning, Jilin, Heilongjiang) had the highest proportion of urban total population and that some of the noncoastal provinces in the south had some of the lowest concentrations. It was also known that the building of new industries and cities in the Chinese hinterland, with its vast natural resources, was gradually resulting in a more balanced distribution of the urban population. The Chinese themselves estimate that whereas before 1949, 65 percent of the urban population lived in the eastern coastal province (presumably) by the late 1970's, the proportion of urban population "in the eastern and western parts of the country was changed to 55 and 45 percent, respectively."[55] That we don't know just what provinces are included in this breakdown is not terribly important. It should be noted that much of the growth of the cities in the interior occurred not simply through the normal influx of rural folk from the surrounding countryside, but by shifting large numbers of skilled urban workers and professionals from the overgrown eastern cities. For example, "since liberation, Shanghai has relocated over 300 industrial plants and sent over one million technicians and workers to other localities throughout the nation."[56]

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[54] Hebei Provincial Service, June 14, 1981, in FBIS, June 22, 1981.

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Based on the above discussion, it must be clear that an official release of provincial urban population totals should be a major event in the study of Chinese population. More is not always better, however, and if two sets of provincial figures suddenly become available we are back in the netherland of Chinese statistics. The excitement of seeing provincial urban figures given to the World Bank mission by the State Statistical Bureau was soon dampened by a radically different set of data contained in the new, Beijing-published 600-page China Encyclopedia Yearbook (see table 2). The figures from the Yearbook are included in descriptions of individual provinces and are not complete. The descriptions sometimes cite the percentage of the population which is urban as well as the urban population in absolute figures; occasionally one or the other figure is omitted. When only one figure was available, the other figure was calculated. It should be noted that in the Yearbook the populations of individual provinces is usually broken down either between "city and town" versus "village" or between "agricultural" and "nonagricultural." It would be reasonable to asume that the "nonagricultural" population would be more inclusive than "city and town" population. There is no significance, however, in these terms. They are used interchangeably and there is no consistent pattern in the direction of the divergence from the figures provided by the State Statistical Bureau.

There is no national total in columns 2 because page 626 of the yearbook gives China's urban population for 1978 as 119,940,000 and 12.5 percent of the total population, and page 41 claims the 1979 urban population constituted 13.2 percent of the total, or 128,160,000. Seemingly an unlikely growth rate for one year.

There are, of course, questions about individual figures as well. In the World Bank series the urban population of Qinghai Province is given as 540,000 at the same time that the Encyclopedia reports 540,000 just for its capital, Xining. There are some obvious problems that relate to the three national-level municipalities (Shanghai, Bei-

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[55] BR, No. 16, April 21, 1980.

[56] Shanghai City Service, October 2, 1980, in FBIS, October 3, 1980.

TABLE 2.—DISTRIBUTION OF PROVINCIAL URBAN POPULATION, 1979

Province	Total population (in millions)	Percent urban		Urban population (in millions)	
		1	2	1	2
National total	970.92	13.2	(1)	128.16	(1)
Southwest region:					
Sichuan	97.74	9.4	(1)	9.19	(1)
Guizhou	27.31	14.1	19.9	3.85	5.21
Yunnan	31.35	6.5	6.0	2.04	(1.88)
Xizang (Tibet)	1.83	6.5	(1)	.12	(1)
Northwest region:					
Shaanxi	28.07	12.0	(15.2)	3.37	4.26
Gansu	18.94	9.4	(13.7)	1.78	2.60
Qinghai	3.72	14.6	(1)	.54	(1)
Ningxia	3.64	16.9	(1)	.72	(1)
Xinjiang	12.56	19.8	(21.3)	2.49	2.68
Central-south region:					
Henan	71.89	8.3	(8.8)	5.97	6.35
Hubei	46.33	9.7	16.1	4.49	7.48
Hunan	52.23	7.0	(12.3)	3.66	6.40
Guangxi	34.70	5.7	11.1	1.98	3.86
Guangdong	56.81	12.0	17.0	6.82	9.50
East region:					
Shanghai	11 32	52.2	(1)	5.91	(1)
Jiangsu	58.92	10.5	(4.0)	6.19	8.25
Zhejiang	37.92	6.5	19.6	2.46	3.64
Anhui	48.03	8.5	(8.5)	4.08	4.07
Fujian	24.88	11.2	(1)	2.79	(1)
Jiangxi	32.29	11.0	14.4	3.55	(4.65)
Shandong	72.32	9.5	(9.1)	6.87	6.61
North region:					
Beijing	8.71	58.5	56.9	5.10	4.95
Tianjin	7.41	65.6	(44.7)	4.86	3.31
Hebei	51.05	10.2	11.5	5.21	(5.87)
Shanxi	24.47	15.6	(19.7)	3.82	4.83
Nei Monggol	18.52	15.2	22.0	2.82	4.08
Northeast region:					
Liaoning	34.43	34.7	31.9	11.95	(11.00
Jilin	21.84	21.7	32.1	4.74	7.01)
Heilongjiang	31.69	24.5	(32.40)	7.76	10.28

[1] Not available.

Sources: Column 1, from "China: Socialist Economic Development." Annex B: "Population, Health and Nutrition," World Bank, June 1, 1981, p. 77. The sum of the provincial total populations is 122,030,000, and not 128,160,000 as given for the national total. Columns 2, from "Zhongguo Baike Nianjian" (China Encyclopedia Yearbook). Yearbook Publishing House, Beijing, 1980. The difference in provincial totals, as implied by some of the figures, are insignificant and therefore excluded from this table. Figures in parentheses are derived rather than reported.

jing, and Tianjin) which are best illustrated with the World Bank figures because there are no gaps in that series. In each instance the reported figures for the municipality correspond to the city proper, probably with its adjacent suburbs. At first glance this seems appropriate, but the problem is that figures exclude not only the rural population of the municipality (as they should), but also the population of the satellite cities—many of which contain over 100,000 people. Take Shanghai, as an example. The municipality reportedly has a population of over 11 million and in addition to the city proper (about 6 million, as reported in the table) it has 12 satellite towns.[57] Just where are the populations of these towns included? Certainly not in the 5,910,000 figure reported by the SSB. Even 25 years ago, before the Shanghai Municipality expanded to incorporate the areas where some of the satellite towns are located, the city was reporting a population of about 7 million (e.g., 6.9 million in 1957). And surely these satellite towns are not included in Jiangsu Province, which is an entity completely independent from Shanghai. The same situation and the same questions are applicable to Beijing and Tianjin. Could this be the reason for the 6.13 million discrepancy between the total urban population and the sum of the provincial urban population (table 2)?

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[57] See, for example, Wen Wei Pao (Hong Kong), March 9, 1980, in JPRS 75453, April 7, 1980.

If the reader concludes that this section shows unseemly overkill—there is a reason. Most people recognize the problems associated with estimating China's total population, but it is difficult to convince even experienced China watchers that the problems with China's urban population are even greater. Some insist that the Chinese security people must have exact urban figures, greatly underestimating the problems of converting police records into population statistics. Most frequently it is maintained that the Chinese must know the size of their urban population because of urban grain rations. The sensitive grain rations, known to be prone to all kinds of abuse, are the responsibility of the Ministry of Cereals—hardly an institution one would turn to for urban statistics. The intent here is to stress, once again, that we should never presume greater accuracy for official Chinese statistics than the Chinese officials do. And they have never, ever claimed accuracy.

CURRENT POLICIES, PROBLEMS, AND PLANS

It would be reasonable to assume that simply by virtue of the fact that 80 percent of China's population relies on agriculture for subsistence, she has managed to limit significantly the problems normally associated with uncontrolled urbanization. This, of course, is not the case, for the 20 percent which does not rely on agriculture represents some 200 million people: Only three nations in the entire world have a *total* population which exceeds that figure! Extending controls over and providing services to a population this size is an overwhelming burden for China, as it would be for any nation, but among all the problems associated with urbanization which are currently vexing the Chinese authorities, two stand out above the others and should receive some attention in this discussion.

HOUSING AND URBAN UNEMPLOYMENT

Housing

In terms of broad priorities, it is certainly more important for the state to feed and clothe the population than to provide it with housing, but the time has come, say the Chinese, to tackle this serious and long-neglected problem. A few statistics from an article in the People's Daily summarize China's urban housing problem. The per capita urban floor space declined from 4.5 square meters in 1952 to 3.6 square meters in 1978. More than one-third of the urban households live in inadequate housing—with the worst conditions in the medium-size and small cities. More than half of the houses in the urban areas are poorly maintained and require repairs, and more than a tenth of these are in dangerous condition.[58]

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[58] Renmin Ribao (People's Daily) (hereafter RMRB), August 5, 1980, in FBIS, August 20, 1980.

In addition to blaming the "gang of four" for the current housing crisis, China admits that the roots of the problem go back many decades. Not only did the new regime inherit a housing inventory in 1949 that was already deficient in many respects, but during most of the years since then—and especially after 1958—the approach toward housing followed the slogan, "We must first develop the mountain slopes before we develop our dwelling places." Consequently, most of the investment in capital construction went to industry, while residential housing struggled to keep pace with urban population growth. The situation started to change only in 1977, and in the next two years (1978 and 1979) 100 million square meters of housing was completed—said to constitute "one-sixth of the total area of housing units completed throughout the country since liberation." [59] The boom continued into 1980, when during the first 11 months there was a 39 percent increase in urban housing over a comparable period in 1979.[60]

Beijing realizes that decades of neglect cannot be reversed in a few years, but hopes for considerable improvement by the end of the century. The basic prerequisites are reasonably clear. China must increase the investments in housing construction; she must make sure that there are adequate supplies of building materials; she must develop the construction industry; and she must "bring into full play the initiative and enthusiasm of construction enterprises." [61] In the meantime, numerous approaches to the housing problem are being discussed and tried—innovations which are not averse to disturbing some rather basic philosophical concepts.

Officials who must solve the problem now seem to believe that the state should not be solely responsible for housing, that the responsibility should be shared with enterprises and individuals.[62] A large proportion of the capital construction funds were already allocated to enterprises to build housing for their workers, but in the last few years there was a special effort to encourage enterprises to provide construction capital through "fund-raising programs of their own." Apparently, it has been successful and in 1979 one-third of the total investment in housing construction in the 192 cities surveyed came from capital raised by enterprises for their own housing. [63]

There has also been much written about the need to "mobilize the enthusiasm of individuals to buy or build their own housing." To help this enthusiasm along, the authorities are devising "creative financing" (Chinese style) and assuring the workers that the ownership of all the housing bought or built by individuals will be protected by law. It should be noted that although the individual will indeed own the housing unit, the construction process involves the state or enterprise in some form of partnership. Only the worker who lives in one of the small cities or towns and who gets the necessary approvals from the authorities can actually build his own house.[64]

There is also talk of reforming the existing rental system, which "takes housing as a welfare arrangement." The problem is that the exceedingly low rents—the pride of the Chinese system—have not been adequate to cover even maintenance expenses. One proposal, in the authoritative Red Flag journal, would limit the state subsidy by requiring that rents paid by individuals and institutions include maintenance, management, and depreciation costs (but not interest).[65] The suggestion is that the only way to meet the demand for housing is to make the rental of living space a profitable enterprise: "housing construction and management departments should stop acting as welfare and charity organizations, but should take the road of becoming an enterprise. . . ."[66] If raising the rents would become too much of a burden on workers and employees, they could be given raises or subsidies, which could then be recovered by the housing departments through the sale or rental of housing units.

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[59] Xinhua, June 1, 1980, in JPRS 75962, June 30, 1980.
[60] BR, No. 2, January 12, 1981.
[61] RMRB, August 5, 1980, in FBIS, August 20, 1980.
[62] Xinhua, June 1, 1980, in JPRS 75962, June 30, 1980.
[63] Hongqi (Red Flag), May 1, 1980, in JPRS 75983, July 3, 1980.
[64] Ibid.

Whatever the final form of some of these fascinating innovations (and they will probably vary from province to province), the changes that have already been made indicate the seriousness with which the Chinese view the current housing crisis. The leaders also know that if China is ever to catch up with the demand for urban housing, the accelerated pace of construction must go hand-in-hand with continued controls over the growth of urban population.

Urban unemployment

As recently as 1976, the New China News Agency proclaimed that China's constitution guarantees employment to all able-bodied people and that "there is no unemployment in new China." Ironically, the dispatch ended with the statement that all new graduates are given work and that "the common preliberation complaint that 'graduation means unemployment' has been banished forever."[67] Just a couple of years later, in the new spirit of open self-criticism, China was admitting that "labor and employment is a major economic and social problem" and that millions of school graduates "are waiting for employment"—still needing a euphemism for the word "unemployed." Both the above contradiction and the present situation were explained in an article which appeared in the People's Daily:

> . . . under the influence of ultra-leftism, the problem of labor and employment was not only ignored but also denied at the time. "There is no population problem in China!" "There is no unemployment problem in China!" "There are no social problems in China!" Under the tremendous pressure of such "prohibitions," scientific studies on population and theories on labor and employment became "forbidden zones," whereas sociology was labeled a "fake science of the bourgeoisie." Nevertheless, matters of objective reality can never be denied. Currently, large numbers of people in our towns and cities are waiting for employment, and it is also obvious that we have more manpower in the countryside than is necessary. Furthermore, many existing enterprises are overstaffed and labor efficiency is low. Therefore, labor and employment has now become an outstanding problem to which the whole nation is paying close attention.[68]

China never really had an easy time providing urban employment for its youth. As discussed earlier, the practice of sending the unemployed (mostly recent school graduates) to the countryside started in the late 1950s and has been continuing for two decades. For years, China claimed a labor shortage in the rural areas, and agriculture and mass rural construction projects acted as a "people-sponge," absorbing everyone that the state sent down. This caused, among other things, underemployment and inefficiency, but outright urban unemployment was probably limited and sporadic.

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[65] Ibid.
[66] Xinhua, June 1, 1980, in JPRS 75962, June 30, 1980.
[67] Xinhua, April 30, 1976.
[68] RMRB, August 19, 1980, in FBIS, September 4, 1980.

Several developments brought the problem of employment to the fore after the demise of the "gang of four" in 1976. Most important, the policy of sending youths to the countryside was eased, while at the same time millions of young men and women who were sent to the communes in previous years took advantage of the more relaxed atmosphere and began drifting back to the cities. Basically an unhappy lot, they felt they had been done wrong and expected that the government should somehow compensate them for lost educational and employment opportunities, but no affirmative action was started by Beijing.

Given the values in the Chinese society, it would be safe to say that the first choice of an overwhelming proportion of both the recent middle school graduates and those who returned from the countryside would be to enter a university. In 1977, 5.7 million, and in 1978, 6 million youths and young adults sat for the national unified college entrance examinations, of which only 278,000 and 400,000 respectively were admitted into the institutions of higher education. Most of those who managed to pass the difficult examinations were, incidentally, the recent middle school graduates whose education was not interrupted by years on a commune. This left many millions of depressed and frustrated youths, who had few skills and little enthusiasm, not only for the jobs they may be asked to fill but for the system which deprived them of opportunity. Both their members and the often defiant attitudes and antisocial conduct they exhibited became a national issue of great concern to the leadership.

At the same time that the urban labor pool was overflowing, the "10 catastrophic years that began in 1966" devastated China's "individual economy" which used to provide millions of urban jobs. In 1953, there were 9 million workers in the cities who managed to make a living outside the socialist systems by pursuing trade, services, and handicrafts. Some 2 million of them even survived the "great leap," when China was "marching on the double into communism," but they could not survive the Cultural Revolution. The practice of individual economy was for many years equated with capitalism, so that by 1978, the number of individuals engaged in something akin to private enterprise was reduced to 150,000.[69]

Faced with severe unemployment and the need to provide jobs to several millions more urban youths entering the work pool every year, China's policymakers and economists were forced to undertake intense analysis and criticism of what caused the employment crisis and what might be done to solve it. While there is no disagreement that the basic cause of the problem is the uncontrolled population growth of previous decades, grown men do not fret over "spilt maotai." Thus, at the same time that China has been pursuing an all-out policy to control population to relieve future problems, she has also been struggling with unemployment by focusing on practices and policies that would have more immediate results. In the past, labor planning was divorced from the national economy and the educational system was divorced from the labor system.[70] At the same time, the innumerable controls and strict restrictions within the existing labor system have greatly diminished opportunities for employment.[71] The solution was to reverse both practices. On the one hand, there should be closer coordination between economic planning, labor planning, and education; on the other hand, much more flexibility and individual initiative should be built into the system. Perhaps slightly contradictory, but not unreasonable goals.

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[69] Ibid.

In reviewing the changes that should be made, some of the most severe attacks were directed at the "unified employment and assignment" system, which for many years was responsible for the assignment of all manpower. It was inefficient, detrimental to productivity, wasteful of talent, and, worst of all, it assured an "iron rice bowl" to every worker—in effect everyone had a tenured position which did not depend on performance or dedication. Despite such criticism, and the trend to permit individuals more freedom in selecting school and job specialties, it is difficult to imagine any rapid changes in labor assignment practices as they relate to the national level economy which is "owned by the whole people." The greatest changes and innovations are occurring in the collective economy sector.

To encourage freer labor market and to create additional jobs, the primary emphasis is now being placed on restoring a form of private enterprise ("individual economy") which flourished before 1958. "Practice has proven," it is now claimed, "that individual economy in towns and cities has an important role to play in providing employment opportunities, increasing social wealth, and satisfying the need of the people." Chinese cities have indeed been suffering from a shortage of all types of consumer services, and the resumption of "individual economy" should fill this gap. The unemployed are urged to use their own initiative in creating jobs for themselves or, by "using self-raised funds," to develop collectively owned enterprises in such activities as retail trade, sewing and mending, food sales, and performing odd jobs.[72] Whether as individuals or as members of cooperatives, these new entrepreneurs must then assume sole responsibility for their own profits and losses. Just in 1980, about 810,000 individuals started their own businesses in the cities and towns of China.[73] Shanghai, for example, reports over 10,000 licensed individual peddlers and traders operating from their homes, street stands, or plying their trade from door to door.[74] In some instances the cities themselves, assisted by some state funds, have recruited youths into service companies to undertake "work needed by the people," such as house repair, loading and unloading of goods, making wooden furniture, et cetera [75]—not unlike the WPA. Youths are also urged to develop collectively owned enterprises which would integrate farming, industry, and commerce on the outskirts of cities, and the existing economic units are asked to help them get established in these new ventures.[76] To take advantage of the international market, other youths are being trained in the highly labor intensive production of arts and crafts.

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[70] Ching-chi Tao-pao (Economic Reporter) (Hong Kong), No. 38–39, October 1980, in JPRS 77269, January 28, 1981.

[71] RMRB, August 13, 1980, in FBIS, August 20, 1980.

[72] Ibid.

[73] BR, No. 21, May 25, 1981.

[74] Xinhua, August 4, 1980, in JPRS 76292, July 26, 1980.

[75] Xinhua, June 28, 1980, in "Summary of World Broadcasts," July 8, 1980.

[76] BR, No. 34, August 25, 1980.

To provide additional employment, Beijing intends to make some basic changes in the country's investment policies. More funds will go into light industries, commerce, and service trades, which are less technology intensive and therefore employ more people. It is pointed out that a heavy industrial enterprise with fixed assets of 1 million yuan hires little more than 90 people, while a light industrial enterprise with the same value of fixed assets hires more than 250 people.[77] Increases in the number of workers have also been suggested in cultural, educational, and public health activities. There have been proposals to reduce the work week so as to provide employment for more people, and a "six-hour four shift" a day system is being considered for the textile industry.[78]

There is no doubt that through "emancipated thinking" and "more relaxed policies" the authorities have managed to open many new avenues for employment. It has been reported that "from 1977 to 1980, about 26.6 million people were given jobs, with 1980 accounting for 9 million."[79] Unfortunately, such figures tell us nothing about the attitudes of the alienated youths—especially those with completed middle school education—or of the long-term compatibility of the rapidly growing "individual economy" with the socialist economy. The numbers, however, are still most impressive, and they clearly tell of the magnitude of the employment problem which must be faced by Beijing and by the leadership of each and every city and town in China.

URBAN PLANNING AND PROSPECTS

City planning must be a frustrating profession in any country, for what should be done must inevitably clash with the political and economic realities of budgets and priorities. The small number of Chinese city planners had yet another handicap to overcome—the contention, during the recurring radical periods, that city planning is nothing more than capitalist nonsense which would only widen the gap between town and country.[80] Only the notion that urban population growth (especially in the largest cities) needs to be controlled remained constant and spanned all the political machinations. The Chinese wrote about urban planning in the 1950s, occasionally discussed it before the Cultural Revolution in the mid-1960s, and pretty much forgot about it during the Cultural Revolution, and its aftermath. Now, as in other fields, Beijing is trying to make up for lost time, closely tying urban planning to the "four modernizations." Given the size of China's urban population and the political obstacles, it is not surprising that officials and city planners are arguing over many of the same issues today that concerned them 25 years ago. Both the problems and the priorities were evident at the October 1980 national conference on urban planning, which was called by the State Capital Construction Commission and attended by urban planners, scholars, and municipal officials. Many difficult tasks face these city planners, and the most basic resolution to come out of the conference, "Rules and regulations on urban planning should be established as soon as possible," will also be the most complex to draw up and implement.[81]

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[77] RMRB, Aug. 19, 1980, in FBIS, Sept. 4, 1980.

[78] BR, No. 34, Aug. 25, 1980.

[79] BR, No. 21, May 25, 1981. If this figure refers only to the urban areas, it seems incredibly high—perhaps about one-third of the urban labor force. There is also an interesting sidelight to this figure. The 26 million newly employed people was first reported by the Chinese news agency on Feb. 4, 1981. On February 13, the French news agency reported from Beijing that China has 26 million jobless people, speculating that this must be an estimate since "there are no official statistics on unemployment in the country" (FBIS, Feb. 13, 1981). Some unsuspecting observer might well combine these two reports and conclude that a year or so ago China had some 52 million urban unemployed!

[80] During the Cultural Revolution "organizations in charge of city planning were abolished, files destroyed, and management planning neglected." (RMRB, Oct. 17, 1980, in FBIS, Nov. 12, 1980).

Although there may not have been any nationally promulgated rules and regulations on urban planning in the past 25 years, there have been innumerable official discussions and recommendations about how cities should develop. But, since there never seemed to be a consensus on the subject, the strategies of the moment were usually short-lived and spottily applied by municipal authorities. The differences were only exacerbated by the influence of Soviet city planners in the 1950s. Unfamiliar with the special characteristics of Chinese cities and disregarding the probable consequences of their advice, Soviet planners urged the construction of oversized public squares, central boulevards, civic centers, sports stadiums, and other features typical of Soviet cities.[82] Some Chinese criticized this expensive, "blind demolition of old buildings" and the clearing of large areas for unproductive use, which also undoubtedly speeded up the development of surrounding suburban areas, necessitating greater investments for water and sewerage lines, communication and transportation facilities, schools, hospitals, and other public institutions. It is true that building on the outskirts of cities made it easier to separate residential areas from factories by parks and other open spaces, to locate these residences up-wind from the industries, and to practice other good zoning principles, but even in the 1950s, some Chinese planners (probably not urban planners) considered this to be an extravagance.[83] The pros and cons of developing the central part of the cities as opposed to the suburban areas are still unresolved and a topic of discussion for Chinese planners, as they are in many other countries.

Directly related to where and how urban construction takes place is the current admission that the main cause of "fragmentation and disjointedness in city planning" has been the practice of decentralized investment and decentralized construction. As discussed in one economics journal, because individual plants and enterprises have their own building funds, they have been deciding the location of the construction sites without any regard to the overall plan. Now they are being criticized for "being a government unto themselves." Uncontrolled construction by enterprises creates a chaotic urban layout and renders impossible any rational plans in civil construction and in public utilities. The practice of "enterprises running society" must be stopped. Urban planners are urged to determine the character and the primary functions of the city (industrial, commercial, mining, touristic, etc.) and then make sure that all construction is approved by the city's planning unit, so that "a rational layout of the city could be assured."[84]

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[81] Xinhua, Oct. 9, 1980, in FBIS, Oct. 10, 1980.

[82] For a detailed discussion of Soviet influence on China's city planning, see K. Fung, "Suburban Agricultural Land Use Since 1949," in C. K. Leung and Norton Ginsburg, eds., "China: Urbanization and National Development," University of Chicago, 1980, pp. 162–66.

[83] See, for example, Chien-she Yueh-k'an (Reconstruction Monthly), Aug. 3, 1956, in FDD (Foreign Documents Division) Summary No. 1245, Feb. 27, 1957.

Another urban concern which dates back to the 1950s relates to achieving a proper balance between production facilities and services for the people. A 1954 People's Daily editorial proclaimed that the number one priority must be the construction of "gigantic and modern industries" in new cities, and it is in connection with this priority that other urban facilities must be built. Existing cities must also be rebuilt, but as a second priority and only "in line with the development of industry." As to large, medium-size, and small cities which are not now important in industrial construction, for the time being "only general maintenance work should be carried out to keep them in repair, and no new construction should be attempted."[85] Probably in response to such thinking did Mao Zedong observe in 1956 that in urban construction some comrades have been concerned only for the "bones"—the plants, machinery, and equipment—and have not paid enough attention to the "flesh"—facilities that serve the public welfare of the people. In this regard Mao's concern for the masses has been revived and the "gang of four" is accused of destroying the "planned proportional development of cities" by not paying enough attention to the "flesh." This related not only to the already discussed problem of housing, but also to improving conditions for living, working, studying, commuting, resting, and carrying on various social activities. But while the proportion of "flesh" to "bones" must increase, the Chinese planners are realistic enough to realize that the limitation of the country's financial and material resources will make this a slow process.[86]

Another serious problem that dates back to the 1950s is related to the use and misuse of land. "Our enormous population pitted against a shortage of arable land" is a serious obstacle to the 'four modernizations,' and land economics must be accorded the same strategic importance as population control, writes one economist. The striking fact is that "over the past 20 years, each year an average of 16 million mu of wasteland was reclaimed, whereas 25 million mu of land was occupied for other uses"[87]—the "other uses," of course, primarily being the growth of cities and the expansion of rural nonfarm activities. The basic complaints have not changed over the years and are closely related to the overall lack of planning just discussed. There has been excessive and unnecessary use of land by industrial enterprises, educational institutions, government facilities, and other units; land is occupied first and then requisitions for building are made; there is the problem of low building density, the construction of too many single-storied buildings and the "nibbling" of land by everyone concerned. And since most cities are located in the more fertile regions of the country, it is the best land that is lost.

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[84] JJYJ, No. 11, Nov. 20, 1979, in JPRS 75408, Mar. 31, 1980

[85] Xinhua, August 11, 1954, in SCMP, August 27, 1954.

[86] JJYJ, No. 11, November 20, 1979, in JPRS 75408, March 31, 1980.

[87] Jingji Guanli (Economic Management), No. 7, July 15, 1980, in JPRS 76462, September 22, 1980.

The problem with land expropriation in the rural areas has been getting steadily worse. Communes located in the midst of farmland have been developing more and more commune-run enterprises and in the process taking up productive land for workshops, dormitories, and other activities; and each new construction seems to take more land than necessary. One county in Hebei Province reports that a commune supply and marketing cooperative has taken twice as much land as necessary; that commune tractor stations with six or seven tractors, which should not require more than 5 or 6 mu of land, occupy 10 to 20 mu; and "a certain commune brick workshop has taken away more than 200 mu of farmland."[88] Also, more and more individual commune members are building new houses for themselves and usually exceeding the prescribed space allocations. Beijing can decry this "anarchy" in the control and use of farmland, but, in a somewhat different sense, controlling land use on some 55,000 communes in China can be just as formidable a task as planning urban growth.

The severity of the land crisis was recently recognized by a State Council circular which called on governments at all levels to "deal sternly with those who willfully take over farmland for housing construction, who forcibly seize land without authorization or who use more land than needed for housing construction." It urged communes, production brigades, and teams to make full use of mountain slopes, wasteland, and abandoned house foundations, and even caves for dwellings and in the cities and suburbs encouraged the building of houses of two or more stories.[89]

Finally, one aspect of urban development which has been discussed most consistently, even when politics was in command, relates to the question of whether China's particular economic, social, and political characteristics warrant the allocation of greater resources for the development of large cities or small cities and towns. The absence of consensus on this issue can be seen from two People's Daily editorials, published just three months apart. One advocated a speedier development of China's small towns as an "important step to more equitably distributed economic construction and to narrow the differences between town and country, worker and peasant."[90] The second editorial said that "merely relying on a subjective desire to narrow the difference between town and the countryside by refraining from building up the cities or by lowering the standards of city projects is tantamount to ignorance or distortion of facts."[91] The context may slightly narrow the contrasting views, but it does not obliterate them.

Over the past decade, the push for smaller cities and towns has certainly received the largest share of publicity in the Chinese media. The most basic of the many suggested advantages of small towns are as follows: (1) they help improve the distribution of industry, (2) they are located closer to natural resources, (3) small town industries help support agriculture and quicken the pace of agricultural modernization, (4) they are marketing links between the cities and the countryside, (5) they are cultural and scientific centers for surrounding villages, and (6) they possess a great potential for helping solve the excess labor problem.[92] In connection with the last notation, it has been pointed out that if each of China's 50,000 small towns would create 2,000 jobs before the end of the century, they would provide "100 million opportunities for unemployed urban youths and absorb some of the surplus labor which surfaces in the countryside." [93]

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[88] RMRB, June 22, 1980, in JPRS 76574, October 8, 1980.
[89] Xinhua, April 20, 1981, in FBIS, April 20, 1981.
[90] Xinhua, April 20, 1981, in FBIS, April 20, 1981.
[91] RMRB, Oct. 17, 1980, in FBIS, Nov. 12, 1980.

Everyone is familiar with the problems of overgrown cities, whether in China or elsewhere in the world—problems of land use, water availability, energy, communications, housing, environmental degradation, distribution of supplies, welfare, and so forth. This notwithstanding, the most recent Chinese thinking on the subject is that the trend toward smaller cities and towns has had adverse economic consequences and that a boost must be given to the large municipalities. The clearest proof of the shifting emphasis is that the "gang of four" is now blamed for "bringing artificial damage to the role of large cities as economic centers." [94] The trend toward economic decentralization has resulted in the proliferation of inefficient and duplicative industrial activities in China's small and medium-size towns, which not only lowered productivity, but has short-stopped the flow of raw materials to large and more efficient plants in Shanghai, Tianjin, Guangzhou, and other large cities. Now it is proclaimed that these large "key cities" must be important regional centers, and must be strengthened so that their advanced development will gradually spread outward to the smaller cities and towns. The old "trickle-down" theory. It is no longer heresy to say, "We must recognize that uneven development of various regions is an objective reality that cannot be overcome according to short-term subjective desires." [95]

Other evidence is now being featured in support of large cities. Some city planners and representatives of construction departments have argued that cities cannot truly fulfill their function if they are too small, pointing to the much higher labor productivity in the big coastal cities, as opposed to the small cities and towns in the interior.[96] Small cities are simply not well equipped to meet the needs of large production units, all of which would undoubtedly prefer to remain and continue building in or around the large cities.[97]

In the final analysis, China cannot afford to shortchange the large cities, which provide the country with the lion's share of the national output value, and she must continue to develop smaller towns, which must indeed play a vital role in modernizing agriculture and absorbing excess manpower. It is not an either or situation, as the rhetoric often leads one to believe, and the pursuit of any rational policy by Beijing should find a balanced approach to the artificial large city/small town contradiction.

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[92] RMRB, Oct. 20, 1980, in JPRS 77007, Dec. 16, 1980.

[93] Xinhua, Feb. 3, 1981, in FBIS, Feb. 4, 1981. There are many variations of this calculation used by Chinese writers.

[94] Xinhua, Nov. 26, 1980, in FBIS, Dec. 2, 1980.

[95] RMRB, Mar. 31, 1981, in FBIS, Apr. 1, 1981.

[96] BR, No. 11, March 17, 1980.

[97] As an aside, it might be noted that Chinese officials and intellectuals love large cities and there is often a direct correlation between the status of the individual and the size of the city in which he holds his position.

III. FOUR MODERNIZATIONS

1. INDUSTRY

GROWTH AND STRUCTURAL CHANGE IN CHINESE INDUSTRY: 1952–79

By Robert Michael Field[*]

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I. INTRODUCTION

In the last three years, the government of the People's Republic of China has released far more data on industrial performance than have been available since the 1950s. In 1979, the State Statistical Bureau (SSB) published a communique on plan fulfillment that included data on the gross value of total, heavy, and light industry and on the output of 35 industrial commodities in 1977 and 1978.[1] The SSB also published a small collection of data that linked the production of 24 commodities in 1978 with output in 1949 and 1952.[2]

Then, in 1980, the SSB made a formal submission to the United Nations Statistical Office that was breathtaking to anyone who has followed the Chinese economy since the imposition of the statistical blackout in 1960. The submission included data on the gross value of industrial output (GVIO) for 12 branches of industry and on the output of 62 industrial commodities in 1977-1979.[3] And now—in 1981—the SSB has released GVIO data by branch of industry and output data on 72 commodities for the years 1949, 1952, 1957, 1965, 1975 and 1979.[4] This substantial body of data is presented in Appendix Tables A1 and A2.

As more and more data have become available, the observer of the Chinese economic scene can answer hitherto unanswerable questions. Are the GVIO and physical output data consistent? Are the current figures comparable to those published in the 1950s? And do they accurately reflect the growth and change in industrial structure of the last three decades?

This paper (a) discusses the nature and coverage of the GVIO data; (b) assesses the validity of the official indexes; (c) estimates price indexes by branch of industry; and (d) shows the impact of the change in prices on the rate of growth and structure of industry.

II. THE CHINESE INDEXES

The SSB output indexes for industry as a whole and 11 branches are presented in Table 1, together with index numbers that I derived for 1977 and 1978. The method of calculating the indexes, the nature of the data on which they are based and the coverage of the branches are described below.

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[1] "Communique of the State Statistical Bureau of the People's Republic of China on Fulfillment of China's1978 National Economic Plan," released June 27, 1979. Communiques have also been released in 1980 and 1981.

[2] SSB, "Main Indicators. Development of the National Economy of the People's Republic of China (1949–1978)," Beijing, 1979. The Main Indicators was published again in 1980 and presumably has been—or will—be published in 1981.

[3] United Nations Statistical Office.

[4] Zhongguo jingji nianjian (1981) (Annual Economic Report of China [1981]). Xue Muqiao et al., eds., Beijing, 1981, pp. VI–14 to VI–16.

TABLE 1.—CHINA: INDEXES OF THE GROSS VALUE OF INDUSTRIAL OUTPUT, BY BRANCH OF INDUSTRY
[1952=100]

	1952	1957	1965	1975	1977	1978	1979
Total	100	228.6	452.6	1,216.4	1,408.8	1,598.6	1,734.4
Metallurgy	100	359.4	895.6	1,768.5	1,782.2	2,263.1	2,516.9
Electric power	100	253.3	934.0	2,699.1	3,059.3	3,493.7	3,824.6
Coal	100	220.5	385.2	762.5	873.7	990.1	1,000.[illegible]
Petroleum	100	411.1	2,317.8	11,763.1	14,844.7	15,269.5	16,342.5
Chemicals	100	389.2	1,449.0	5,170.6	6,009.8	7,446.9	7,969.3
Fertilizers and insecticides	100	622.4	10,164.4	33,306.7	43,846.6	55,330.4	57,988.5
Machinery	100	366.7	955.9	3,783.0	4,405.8	4,908.6	5,288.2
Agricultural machinery	100	434.5	2,211.4	17,420.7	22,598.2	24,528.7	23,093.5
Building materials	100	248.5	433.3	1,170.4	1,561.3	1,802.1	1,959.0
Timber	100	190.1	186.9	243.5	279.0	308.6	337.9
Food products	100	185.5	235.4	397.3	448.4	485.4	533.8
Textiles	100	151.1	232.2	419.3	487.6	560.1	627.8
Paper	100	239.5	381.1	611.7	702.5	795.6	891.1

Source: "Zhongguo jingji nianjian (1981)," ("Annual Economic Report of China [1981]"), Xue Muqiao et al., eds., Beijing 1981, p. VI–14, except as noted: 1977–78: Derived from the gross value of output in table A1 and the price indexes in table 9. Petroleum, 1975: The reported 10,703.1 appears to be a misprint. Chemicals, 1975 and 1979: Derived from the gross value of output in table A1 and the price index in table 9. The 5,294.8 reported for 1975 and the 7,782.4 reported for 1979 are inconsistent. Fertilizers and insecticides, 1957: The reported 632.4 appears to be a misprint.

Both the official and the derived indexes are based on GVIO data. These data, which include the output of factories, mines and public utilities, are in (a) 1952 constant prices for the years 1952 through 1957; (b) constant 1957 prices for the years 1957 through 1971; and (c) constant 1970 prices for the years 1971 through 1979. Indexes are calculated for each interval separately and then linked together to form an index for the period as a whole. For example, the index number formula for 1979 (with 1952 = 100) is:

$$\frac{\Sigma P_{52}Q_{57}}{\Sigma P_{52}Q_{52}} \cdot \frac{\Sigma P_{57}Q_{71}}{\Sigma P_{57}Q_{57}} \cdot \frac{\Sigma P_{70}Q_{79}}{\Sigma P_{70}Q_{71}}$$

where P stands for price and Q for quantity. Thus the final index is in constant prices, but not in the prices of any single year.

Chinese and Western observers generally consider the GVIO data methodologically deficient because they are collected by the "factory reporting method." Under this system, each enterprise reports the gross value of its output in constant prices, net of intraenterprise transfers. Because deductions are not made for semi finished inputs purchased from other enterprises, changes in the degree of vertical integration affect the reported level of output and the degree of double counting independently from changes in the real level of production. For example, increased specialization of production tends to inflate GVIO (because more semifinished inputs are purchased), whereas mergers that combined enterprises in different stages of production into a single accounting unit tend to lower GVIO.[5] Because of these shortcomings, the official indexes will be compared with independently constructed indexes in the next section of this paper in order to get a feel for their accuracy.

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[5] For a detailed discussion of the GVIO data, see Robert Michael Field, Nicholas R. Lardy and John Philip Emerson, "A Reconstruction of the Gross Value of Industrial Output by Province in the People's Republic of China: 1949–73, Foreign Economic Reports," No. 7, U.S. Department of Commerce, 1975, pp. 2–8.

Before these comparisons are made, however, the coverage of the individual branches of industry should be discussed. The Chinese have revised their industrial classification system at least three times in the last 30 years.[6] The 1978 list of branches and subbranches—which is the most recent and most complete—was given by the SSB to a U.S. Statistical Delegation that visited Beijing in November 1979.[7] This list has 11 branches and 44 subbranches, whereas the data in the Annual Economic Report or supplied to the United Nations Statistical Office has 12 branches and 17 selected subbranches.[8]

The coverage of the branches has to be inferred by comparing the recently released data for 1952 and 1957 with a careful reconstruction by Dr. Thomas B. Wiens of the data published in the 1950s. This comparison is presented in Table 2. The Wiens data (which is divided

TABLE 2.—CHINA: GROSS VALUE OF INDUSTRIAL OUTPUT, BY BRANCH OF INDUSTRY, 1952 AND 1957

[Million 1952 yuan]

	1952		1957	
	Official	Wiens	Official	Wiens
TOTAL	34, 330	34, 326	78, 400	78, 386
METALLURGY	2, 020	1, 993	7, 260	7, 521
FERROUS METALS	(1)	1, 370	(1)	5, 224
NONFERROUS METALS	(1)	623	(1)	2, 297
ELECTRIC POWER	430	431	1, 090	1, 105
FUELS	(1)	1, 066	(1)	2, 738
COAL	830	859	1, 830	1, 724
PETROLEUM	180	------------	740	------------
Other	(2)	207	(2)	1, 014
CHEMICALS (including rubber, and oils, fats, and cosmetics?)	1, 660	1, 726	6, 460	5, 920
Chemicals	(2)	874	(2)	4, 320
RUBBER	(1)	513	(1)	1, 165
Oils, fats, and cosmetics	(2)	339	(2)	435
MACHINERY	3, 900	3, 441	14, 300	12, 326
Machine building	(2)	1, 424	(2)	6, 117
Metal products	(2)	1, 434	(2)	4, 380
REPAIR	(1)	583	(1)	1, 829
BUILDING MATERIALS (including glass, ceramics and nonmetallic mining?)	1, 030	1, 014	2, 560	2, 536
Building materials	(2)	779	(2)	1, 977
GLASS	(1)	138	(1)	342
CERAMICS	(1)	96	(1)	212
NONMETALLIC MINING	(1)	1	(1)	5
TIMBER	2, 230	1, 943	4, 240	3, 694
FOOD PRODUCTS	8, 280	7, 454	15, 360	15, 014
TEXTILES, SEWN GOODS, AND FUR AND LEATHER	(1)	------------	(1)	------------
TEXTILES	9, 430	9, 425	14, 250	13, 996
PAPER, AND EDUCATIONAL:				
GOODS	(1)	------------	(1)	------------
PAPER	760	764	1, 820	1, 830
Residual	3, 580	5, 069	8, 570	11, 706
MATCHES	(1)	108	(1)	130
SEWN GOODS	(1)	1, 098	(1)	2, 866
LEATHER AND FURS	(1)	561	(1)	877
CULTURAL, EDUCATIONAL, AND ART PRODUCTS	(1)	676	(1)	1, 643
Other	(2)	2, 632	(2)	6, 134

[1] Data classified according to the 1978 system are not available.
[2] The category is not applicable because it is drawn from the Wiens study.

Note: Stub headings in upper case indicate a branch or subbranch from the SSB 1978 classification system; headings in lower case indicate a branch from the Wiens study.

Sources: "Zhongguo jingji nianjian (1981)" ("Annual Economic Report of China [1981]") Xue Muqiao et al., eds., Beijing, 1981, p. VI-14. Thomas B. Wiens, in cooperation with K. C. Yeh, "The Composition of the Gross Value of Factory and Handicraft Output in the People's Republic of China, 1952–57", Mathtech, Inc., Bethesda, Md., October 1979.

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[6] For a discussion of the changes in coverage in the 1950s, see Thomas B. Wiens, in cooperation with K. C. Yeh, "The Composition of the Gross Value of Factory and Handicraft output in the People's Republic of China, 1952–1957, MATHTECH, Inc., Bethesda, Md., October 1979.

[7] (State Statistical Bureau), Gongye bumen fenlei mulu (Branch of Industry Classification List), (Beijing), (1978). See Appendix B.

[8] See Appendix Table A1.

into the 23 branches of the SSB's 1956 classification) is regrouped to match the current system. As a complete distribution of GVIO by branch of industry for the 1950s had not been published, Wiens was forced to piece together data from a large number of sources. The agreement between the two sets of data is close enough to show that the recent data for the 1950s are consistent with the data published at the time, and indicates to which category in the 1978 list the data actually correspond.

Of the branches shown in Table A1, coal, petroleum, textiles and paper refer to subbranches in the SSB's 1978 list; and 5 of the 17 selected subbranches appear to refer to some combination of or variation in the subbranches, or to a small subcategory from the list. Because of these differences, "Other" (which is listed explicitly in the data for 1977–1979 supplied to the United Nations Statistical Office and derived as the residual for the remaining years) is considerably broader than the category "Other Industries" in the SSB list.

III. THE ACCURACY OF THE INDEXES

The accuracy of the official output indexes, which the Chinese derived from GVIO data, is checked by a branch-by-branch-comparison with indexes calculated from physical output data. Whereever possible separate indexes are constructed for subbranches in order to reflect the structure of industry. These subbranch indexes are then aggregated; the average shares in the gross value of output produced by the respective branches during the years 1977–1979 are used as weights. The method of construction and the nature of coverage for each branch of industry are discussed briefly in this section.

A. THE ENERGY INDUSTRIES

The official and estimated indexes for the energy industries are presented in Table 3. The estimated index for electric power is derived from the output of electricity. The two indexes are extremely close period by period and over the 27 years as a whole. The differences are caused by the fact that not all power is sold. Some is consumed by the power industry itself or lost in transmission, and some is produced directly by enterpries for their own use. Thus the coverage of the indexes is not quite the same.

The estimated index for coal is derived from physical output. These two indexes are also extremely close. The differences are probably caused by variations in the rates of growth at large and small mines and in the quality of coal produced.

The estimated index for petroleum is the weighted average of indexes for extraction and refining. The index for extraction is based on the production of crude oil even though the subbranch includes natural gas; the value of natural gas, however, is so small in relation to the value of crude oil that it is ignored. The index for refining is derived from the quantity of crude oil refined. The differences between the official and estimated indexes, which are more serious than for any other branch of industry, appear to stem from institutional factors as well as from the weakness of the estimate. As refineries operating

TABLE 3.—CHINA: OFFICIAL AND ESTIMATED INDEXES OF OUTPUT FOR THE ENERGY INDUSTRIES

	Electric power		Coal		Petroleum			
						Estimated		
	Official [2]	Estimated [1]	Official [3]	Estimated [1]	Official [5]	Total [4]	Extraction [5]	Refining [6]
Index (1957=100):								
1952	39.4	37.5	45.4	50.9	24.3	29.4	29.9	29.2
1957	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1965	368.4	349.5	174.0	177.3	563.8	650.3	755.7	604.8
1975	1,064.7	1,012.6	345.8	368.9	2,861.4	3,623.5	5,265.3	3,020.3
1977	1,206.8	1,155.1	396.3	421.2	3,611.0	4,378.7	6,422.4	3,636.9
1978	1,378.2	1,326.5	449.0	472.6	3,714.3	4,890.3	7,136.4	4,075.1
1979	1,508.7	1,457.9	453.8	486.1	3,975.3	4,960.9	7,260.5	4,118.9
Rate of growth (percent):								
1952–57	20.4	21.6	17.1	14.5	32.7	27.8	27.3	27.9
1957–65	17.7	16.9	7.2	7.4	24.1	26.4	28.8	25.2
1965–75	11.2	11.2	7.1	7.6	17.6	18.7	21.5	17.4
1975–79	9.1	9.5	7.0	7.1	8.6	8.2	8.3	8.1

[1] Table 1.
[2] Derived from the output of electricity in table A2.
[3] Derived from the output of coal in table A2.
[4] Derived from the indexes of extraction and refining using the average shares of GVIO in 1977–79 from table A1 as weights.
[5] Derived from the output of crude oil in table A2.
[6] Derived from the estimated supply of crude oil in table A2.

in conjunction with petrochemical plants fall under the jurisdiction of the Ministry of Chemical Industry, the value of their output is probably included with chemicals or may not be reported at all if the refinery is part of an integrated chemical enterprise. Thus the official index is probably somewhat understated. On the other hand, the estimated index may grow too fast because the single series for crude oil refined cannot take account of the impact on value of the increasing share of low-value heavy residuals.

B. THE MACHINERY INDUSTRY

Machinery, which is the largest branch of industry, presents a special problem. Its 10 subbranches range from the manufacture of agricultural machinery and industrial equipment through electronics and machinery for household use to repair of machinery, equipment, and metal products.[9] The 28 commodities for which output data are available fall into 7 of the subbranches.[10] GVIO data for 1977–1979 are available as weights for four subbranches and one category whose coverage is uncertain,[11] and output indexes can be constructed for only three of them. Furthermore, the output indexes for these subbranches are more typical of the machine-building sector as it was defined in the 1950s than of the machinery industry as a whole.[12]

The official index for the machinery industry, therefore, is evaluated in two stages. First, an index for the machine-building industry is presented in Table 4. The indexes for the three subbranches are weighted by their relative shares in GVIO for the years 1977–1979.

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[9] For the complete list of subbranches and the more detailed categories of which they consist, see Appendix B.
[10] See Appendix Table A2.
[11] See Appendix Table A1.
[12] In the 1950s, the industry was divided into machine building, metal products and repair, with machine building growing the most rapidly. The activities represented by the first seven subbranches in the 1978 list were classified as machine building, the next two as metal products, and the last as repair.

For agricultural machinery, the official index is used as there are not enough physical output data to derive a satisfactory index. The indexes for industrial equipment and transport equipment are estimated from output data by using every series for which a suitable price is available.

TABLE 4.—CHINA: OFFICIAL AND ESTIMATED OUTPUT INDEXES FOR THE MACHINE-BUILDING INDUSTRY

	Total			Official agricultural machinery [4]	Estimated industrial equipment [5]	Estimated transport equipment [5]
	Official [1]	Estimated [2]	Linked [3]			
Index (1957=100):						
1952	23.1	31.3	23.1	23.0	36.9	26.5
1957	100.0	100.0	100.0	100.0	100.0	100.0
1965		241.4	241.4	509.0	230.1	212.8
1975		1,391.1	1,391.1	4,009.4	1,472.2	904.8
1977		1,440.6	1,440.6	5,201.0	1,524.5	756.9
1978		1,645.2	1,645.2	5,645.3	1,681.5	995.5
1979		1,702.9	1,702.9	5,315.0	1,745.3	1,106.0
Rate of growth (percent):						
1952–57	34.1	26.2	34.1	34.2	22.1	30.4
1957–65		11.6	11.6	22.6	11.0	9.9
1965–75		19.1	19.1	22.9	20.4	15.6
1975–79		5.2	5.2	7.3	4.3	5.2

[1] Derived from the Wiens data in table 2. He cites State Statistical Bureau sources.

[2] Derived from the indexes of agricultural machinery, industrial equipment and transport equipment using the average shares of GVIO in 1977–79 from table A1 as weights.

[3] Derived by linking the estimated index to the official index in 1957. The indexes are linked so the residuals for the years 1952 and 1957 in table 5 will be correct.

[4] Table 1.

[5] Derived from the physical output data in table A2 and the 1957 prices in table A3.

Second, the estimated gross value of the machinery industry is compared with the gross value of the machine-building industry and of metal products and repair in Table 5. The gross values of machinery and machine building are calculated from the official values in 1952 yuan and the official and estimated indexes, respectively; the gross value of metal products and repair is derived as the residual.

TABLE 5.—CHINA: GROSS VALUE OF THE MACHINE INDUSTRY, BY MAJOR SECTOR

	Machinery [1]		Machine building [2]		Metal products and repair [3]	
	Million 1952 yuan	Index (1957=100)	Million 1952 yuan	Index (1957=100)	Million 1952 yuan	Index (1957=100)
Output:						
1952	3,900	27.3	1,424	23.1	2,476	30.5
1957	14,300	100.0	6,177	100.0	8,123	100.0
1965	37,268	260.7	14,911	241.4	22,357	275.2
1975	147,537	1,031.6	85,928	1,391.1	61,609	758.5
1977	171,822	1,201.4	88,986	1,440.6	82,836	1,020.0
1978	191,435	1,338.6	101,624	1,645.2	89,811	1,105.6
1979	206,240	1,442.1	105,188	1,702.9	101,052	1,244.0
Rate of growth (percent):						
1952–57	29.7		34.1		26.8	
1957–65	12.7		11.6		13.5	
1965–75	14.7		19.1		10.7	
1975–79	8.7		5.2		13.2	

[1] Derived from the GVIO for 1952 in table A1 and the index in table 1.

[2] Derived from the GVIO for 1952 in table 2 and the estimated index in table 4.

[3] Derived as the residual.

The rates of growth for metal products and repair appear to be reasonable in relation to those for machine building and the machinery industry as a whole. But the meaning of the residual is not clear as neither the machinery nor the machine-building series is valued in the prices of a single year. The formula for the official index (which is given in the previous section) links separate indexes that are in prices of 1952, 1957 and 1970, respectively, and the formula for the estimated index is:

$$\frac{\Sigma G_{77-79}\frac{\Sigma P_{57}Q_t}{\Sigma P_{57}Q_{77-79}}}{\Sigma G_{77-79}}$$

where G_{77-79} stands for the average gross value of the subsector in the years 1977–1979, P_{57} for the 1957 price, and Q for physical output.

C. THE MATERIALS INDUSTRIES

The official and estimated indexes for the materials industries are presented in Table 6. The estimated index for chemicals is the weighted average of indexes for basic chemicals, fertilizers and insecticides, rubber and plastics, and pharmaceuticals. The basic chemicals index is estimated from the output series for which prices are available and the series for calcium carbide. As the output of calcium carbide grew more rapidly than that of the other basic chemicals, the index would be too low if it were not included. In the absence of a price, it was valued at the weighted average of the prices for the other basic chemicals.

The index for fertilizers and insecticides is based on the total production of chemical fertilizer even though a series for insecticides is available; the value of insecticides, however, is so small in relation to the value of fertilizers that it is ignored. That the official and estimated indexes for fertilizers and insecticides differ considerably is not surprising. Many varieties of fertilizer are produced and the quality of fertilizer from small plants is far below that of the urea, ammonium sulfate, or superphosphate produced by the large modern plants. As the estimated index is based on a single series, it can not take into account changes in the output mix or differences in price.

The index for rubber and plastics is the unweighted average of indexes for the production of tires and plastics, and the index for pharmaceuticals is derived from the output of the series for the total production of chemical pharmaceuticals. Over the 27 years as a whole, the official and estimated indexes for the chemicals industry are close; period by period, however, the differences are greater as the estimated indexes do not have enough detail to capture the rapid change in the structure of the industry.

The estimated index for metallurgy is based on the output of those items for which prices are available. The estimated index falls slightly behind the official index as neither output series nor prices are available for the rapidly growing nonferrous metals. The differences, however, are not serious.

The estimated index for building materials is the weighted average of indexes for cement and glass which are each derived from the output of a single series. The estimated index grows somewhat faster than the official index, probably because no weight is available for the slower growing output of bricks and tiles or ceramics. The estimated index for the timber industry is based on a single output series for the production of timber. As the industry includes the value of timber processing as well as that of felling and transporting logs, it is not surprising that there is some difference between the official and estimated indexes.

TABLE 6.—CHINA: OFFICIAL AND ESTIMATED OUTPUT INDEXES FOR THE MATERIALS INDUSTRIES

	Chemicals						
	Official [1]		Estimated				
	Total	Fertilizers and insecticides	Total [2]	Basic chemicals [3]	Fertilizers and insecticides [4]	Rubber and plastics [5]	Pharmaceuticals [6]
Index (1957=100):							
1952	25.7	16.1	28.2	35.3	25.8	42.0	4.5
1957	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1965	372.3	1,633.1	432.2	310.1	1,143.0	348.3	477.3
1975	1,328.5	5,351.3	1,155.2	640.7	3,474.8	1,101.4	1,240.9
1977	1,544.1	7,044.8	1,460.6	675.8	4,793.4	1,430.8	1,600.0
1978	1,913.4	8,889.8	1,760.0	822.3	5,757.0	1,793.8	1,850.0
1979	2,047.6	9,316.9	2,008.8	900.4	7,055.6	2,165.8	1,895.5
Rate of growth (percent):							
1952-57	31.2	44.1	28.8	23.2	31.1	18.9	85.9
1957-65	17.9	41.8	20.1	15.2	35.6	16.9	21.6
1965-75	13.6	12.6	10.3	7.5	11.8	15.5	10.0
1975-79	11.4	14.9	14.8	8.9	19.4	18.4	11.2

	Metallurgy		Building materials				Timber	
				Estimated				
	Officical [1]	Estimated [7]	Official [1]	Total [8]	Cement [9]	Glass [10]	Official [1]	Estimated [11]
Index (1957-100):								
1952	27.8	26.6	40.2	43.2	41.7	46.1	52.6	40.2
1957	100.0	100.0	100.0	100.0	100 0	100.0	100.0	100.0
1965	249.2	215.1	174.4	207.7	237.6	148.7	98.8	142.7
1975	492.1	418.9	471.0	553.2	674.3	314.5	128.1	166.0
1977	495.9	419.8	628.3	661.8	811.2	367.3	146.8	178.2
1978	629.7	565.5	725.2	776.9	951.0	433.8	162.3	185.1
1979	700.3	621.5	788.3	844.4	1,077.3	504.3	177.7	195.2
Rate of growth (percent):								
1952-57	29.2	30.3	20.0	18.3	19.1	16.8	13.7	20.0
1957-65	12.1	10.0	7.2	9.6	11.4	5.1	-.2	4.5
1965-75	7.0	6.9	10.4	10.3	11.0	7.8	2.7	1.5
1975-77	9.2	10.4	13.7	12.4	12.4	12.5	8.5	4.1

[1] Table 1.

[2] Derived from the indexes of basic chemicals, fertilizers and insecticides, rubber and plastics, and pharmaceuticals using the average shares of GVIO in 1977–79 from table A1 as weights.

[3] Derived from the output data in table A2 and the 1952 prices in table A3.

[4] Derived from the output of chemical fertilizer in table A2.

[5] Derived as the unweighted average of indexes for rubber tires and plastics with 1977–79 equal to 100.

[6] Derived from the output of pharmaceuticals in table A2.

[7] Derived from the physical output data in table A2 and the 1952 prices in table A3.

[8] Derived from the indexes of cement and glass using the average shares of GVIO in 1977–79 as weights.

[9] Derived from the output of cement in table A2.

[10] Derived from the output of plate glass in table A2.

[11] Derived from the output of timber in table A2.

D. THE LIGHT INDUSTRIES

The official and estimated indexes for the light industries are presented in Table 7.[13] The estimated index for food products is based on those commodities for which suitable prices are available. It grows more slowly than the official index because prices were not available for the output of rapidly growing series such as canned goods.

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[13] The light industries—which are here defined to include food products, textiles, and paper—are different from consumer goods (which would not include paper or part of textiles) and from light industry as officially defined (which includes part of the output of branches that are primarily heavy industry such as pharmaceuticals, machinery for household use, or the manufacture of wood products).

The estimated index for textiles is the weighted average of indexes for chemical fibers and other textiles. The former is derived from the output of a single series and the latter from the output of those commodities for which prices were available. In the last few years, the estimated index has tended to fall behind the official index because output series are not available for such rapidly growing items as cotton and wool knit goods. The difference, however, is not serious.

The estimated index for paper, which is derived from the estimated output of paper, grows faster than the official index, particularly in the last 15 years. As the series includes various kinds of paper and relatively inexpensive paperboard, a slight change in output mix could easily account for the difference.

TABLE 7.—CHINA: OFFICIAL AND ESTIMATED OUTPUT INDEXES FOR THE LIGHT INDUSTRIES

	Food products		Textiles				Paper	
				Estimated				
	Official [1]	Estimated [2]	Official [1]	Total [3]	Chemical fibers [4]	Other [5]	Official [1]	Estimated [6]
Index (1[illegible]00):								
1952	53.9	57.1	62.2	71.1	0.0	71.1	41.8	44.1
1957	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1965	126.9	136.6	153.7	152.4	25,050.0	149.1	159.1	141.7
1975	214.2	204.6	277.5	248.7	77,400.0	238.5	255.4	279.3
1977	241.7	224.3	322.7	273.5	94,900.0	261.0	293.3	308.7
1978	261.7	260.1	370.7	306.1	142,300.0	287.3	332.2	359.3
1979	287.8	252.7	415.5	337.2	163,150.0	315.5	372.1	403.7
Rate of growth (percent):								
1952–57	13.2	11.9	8.6	7.1	----------	7.1	19.1	17.8
1957–65	3.0	4.0	5.5	5.4	99.5	5.1	6.0	4.5
1965–75	5.4	4.1	6.1	5.0	11.9	4.8	4.8	7.0
1975–79	7.7	5.4	10.6	7.9	20.5	7.2	9.9	9.6

[1] Table 1.

[2] Derived from the physical output data in table A2 and the 1952 prices in table A1. Because the series for dairy products is incomplete, the index was calculated by the method described in appendix C of Robert Michael Field, "Civilian Industrial Production in the People's Republic of China: 1949–74," in Joint Economic Committee of the U.S. Congress, "China: A Reassessment of the Economy", Washington, D.C., 1975, pp. 171–174.

[3] Derived from the indexes of chemical fibers and other textiles using the average shares of GVIO in 1977–79 as weights.

[4] Derived from the output of chemical fibers in table A2.

[5] Derived from the physical output data in table A2 and the 1952 prices in table A3.

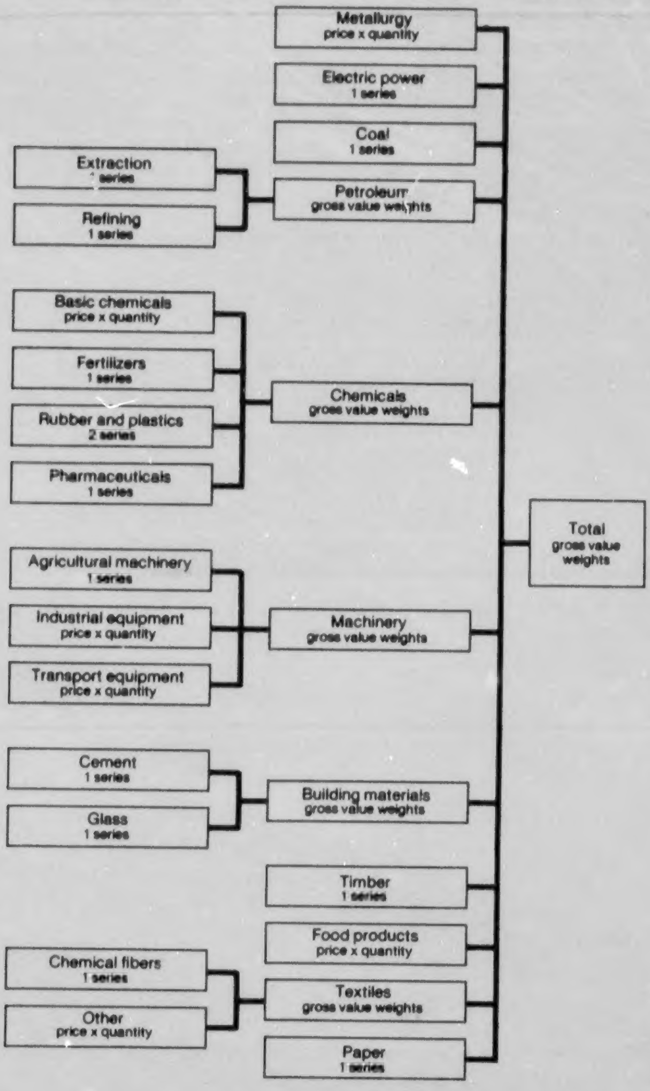
[6] Derived from the output of paper in table A2.

E. SUMMARY

The structure of the estimated industrial output index is summarized in Figure 1. Separate indexes for the 11 branches of industry are weighted by their average shares in GVIO during 1977–1979, and the branch indexes are further subdivided wherever output data and GVIO weights are available. Of the 19 branch and subbranch indexes that cannot be disaggregated further, 11 are based on the output of a single commodity, 6 are derived as the sum of price times quantity, one is the unweighted average of 2 series and one is an official GVIO index. In total, series for 45 commodities are used and the index is subdivided more finely than has been possible before.

The official and estimated branch of industry indexes for 1979 are assembled in Table 8. They are remarkably close, despite the theoretical deficiencies of the official indexes and the practical shortcomings of the indexes that I estimated. For those industries producing relatively homogeneous goods—such as metallurgy, electric power, coal, building

Figure 1
China: Structure of the Estimated Industrial Output Index


Metallurgy
price x quantity
Electric power
1 series
Coal
1 series
Extraction
1 series
Refining
1 series
Petroleum
gross value weights
Basic chemicals
price x quantity
Fertilizers
1 series
Rubber and plastics
2 series
Pharmaceuticals
1 series
Chemicals
gross value weights
Total
gross value weights
Agricultural machinery
1 series
Industrial equipment
price x quantity
Transport equipment
price x quantity
Machinery
gross value weights
Cement
1 series
Glass
1 series
Building materials
gross value weights
Timber
1 series
Food products
price x quantity
Chemical fibers
1 series
Other
price x quantity
Textiles
gross value weights
Paper
1 series

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materials and timber—and for the slower growing, more stable light industries—such as food products, textiles and paper—the data suggest that the official and estimated indexes are consistent. For the more rapidly growing petroleum, chemicals and machinery industries, however, the conclusion is not so clear. These industries produce large numbers of very different commodities, some of which have grown extremely rapidly. In the petroleum industry, for example, the number of products produced has risen from 140 in the First Five-Year Plan period to 687 in 1979, yet only a single series for the total amount of crude oil refined is available. Nevertheless, it appears that GVIO indexes are reasonably reliable measures of Chinese industrial output.

TABLE 8.—CHINA: OFFICIAL AND ESTIMATED INDEXES OF INDUSTRIAL OUTPUT, BY BRANCH OF INDUSTRY, 1979
[1957=100]

	Official	Estimated
Metallurgy	700.3	621.5
Electric power	1,508.7	1,457.9
Coal	453.8	486.1
Petroleum	3,975.[illegible]	4,960.9
Chemicals	2,047.6	2,008.8
Machinery	1,442.1	
Machine building		1,702.9
Metal products and repair		1,244.0
Building materials	788.3	884.4
Timber	177.7	195.2
Food products	287.8	252.7
Textiles	415.5	337.2
Paper	372.1	403.7

Source: Tables 1 to 7.

IV. THE IMPACT OF PRICE CHANGE ON THE GROWTH AND STRUCTURE OF INDUSTRY

Industrial price indexes by branch of industry are presented in Table 9. These indexes are derived from the GVIO data and the output indexes that the Chinese have published this year. In 1957, for example, the gross value of metallurgy in million 1957 yuan is:

$$\Sigma P_{57}Q_{57}=6,000$$

and the gross value in million 1952 yuan (which is derived as the product of the 1952 gross value in 1952 prices and the output index) is:

$$\Sigma P_{52}Q_{52}\cdot\frac{\Sigma P_{52}Q_{57}}{\Sigma P_{52}Q_{52}}=\Sigma P_{52}Q_{57}=7,260$$

and the price index is:

$$\frac{\Sigma P_{57}Q_{57}}{\Sigma P_{52}Q_{57}}=\frac{\Sigma P_{52}Q_{57}\left(\frac{P_{57}}{P_{52}}\right)}{\Sigma P_{52}Q_{57}}=\frac{6,000}{7,260}=86.2$$

which is the price relative for individual commodities weighted by 1957 output valued in 1952 constant prices.

As GVIO data in 1957 constant prices and output indexes are also available for 1965, the 1957 prices indexes were estimated independently and compared with the first set. The two sets of 1957 price indices differ by less than 0.1 percent, except for fertilizers and insecticides. The reported output index of 632.4 for 1957 appears to be a misprint as a 1957 index of 622.4 yields the same price index as the 1965 data. Because of the slight differences due to rounding, all of the price indexes in Table 9 are derived as the geometric means of the two estimates. With both GVIO data and output indexes available for 1977 and 1979, the price indexes for 1970 were derived by the same procedure.

TABLE 9.—CHINA: INDUSTRIAL PRICE INDEXES BY BRANCH OF INDUSTRY, 1957 AND 1970

	1957 (1952-100)	1970 (1957=100)	1970 linked index (1952=100)
Total:			
Official	89.7	85.9	77.1
Calculated	90.8	84.0	76.2
Metallurgy	82.6	97.6	80.7
Electric power	107.3	100.1	107.4
Coal	112.6	126.3	142.2
Petroleum	108.1	78.5	84.9
Chemicals	74.6	56.9	42.5
Machinery	83.2	72.5	60.4
Building materials	88.7	93.5	82.9
Timber	95.8	117.5	112.5
Food products	90.1	130.3	117.4
Textiles	100.8	99.4	100.2
Paper	84.6	105.3	89.0

Note: The calculated indexes are for the 11 branches of industry included in this table.

Sources: Derived from the indexes in table 1 and the GVIO data in table A1 by the method described in the text.

In the short time that the new data have been available, it has not been possible to carry out a thorough analysis of the change in constant prices since 1952. But it is interesting, for example, to see that the price of coal—which has been in chronically short supply—has increased 26.3 percent since 1957 and 42.2 percent since 1952. Many of those who follow Chinese energy have advocated increasing the price of coal to stimulate production and curtail consumption. Perhaps the Chinese have not raised the price of coal enough, but they have raised it substantially.

A second point of interest is that chemicals and machinery—the two branches of industry that have shown the most rapid improvement in technology and the greatest change in product mix—have also seen the sharpest reductions in price. And perhaps most interesting is the price change for food products between 1957 and 1970. The Chinese have frequently said that real wages of workers and employees stagnated during the 1960s and the first half of the 1970s. I had been aware that food prices were increasing but had not realized how fast. Given the large proportion of the household budget that is spent on food, one can readily understand why real wages had not grown.

The output of industry by major sector is presented in Table 10, together with the shares of the total and the rates of growth. Because of the price changes over the 27 years, the data are presented in both 1952 and 1957 prices. Both sets of figures show the rapid growth of Chinese industry since 1952. After an extraordinary growth in the First Five-Year Plan period (1953–1957), the rate fell off, to a quite respectable long-term 10 percent (as measured in 1952 prices—or about 9 percent in 1970 prices). This growth has been characterized by the priority development of the heavy industries, which rose from 40 percent of the total in 1952 (as measured in 1952 prices—or 33 percent in 1970 prices) to 81 (or 72) percent in 1979.

Looking at the benchmark years in Table 10, however, gives an impression of much greater stability and regularity in the process of development than has in fact been the base. During the Leap Forward (1958–1960), for example, orderly industrial development was abandoned. Output surged to successive peak levels, but the Leap quickly proved to be an ill-conceived attempt to speed up the rate of growth by driving men and machines at a pace that could not be maintained. In 1961 and again in 1962, production fell sharply. Most of the growth in industrial production during the years 1958–1960 would have occurred even without a Leap Forward. Because the acceleration of the existing industrial construction program during 1958 and 1959 resulted in large additions to capacity, merely putting new plants into operation would have been enough to guarantee China substantial gains in industrial production.

TABLE 10.—CHINA: STRUCTURE AND GROWTH OF INDUSTRY, 1952 AND 1979

	Total	Energy	Machinery	Materials	Light industries
Output (billion yuan):					
1952 prices:					
1952	30.75	1.44	3.90	6.94	18.47
1957	69.91	3.66	14.30	20.52	31.43
1965	144.63	11.39	37.28	51.68	44.28
1975	397.35	39.11	147.54	133.61	77.09
1979	581.43	54.17	206.24	210.85	110.17
1970 prices:					
1952	29.69	1.79	2.36	5.70	19.84
1957	62.44	4.40	8.63	15.49	33.92
1965	115.49	12.40	22.50	33.20	47.39
1975	292.22	39.43	89.05	81.38	82.36
1979	418.54	54.44	124.48	122.41	117.21
Shares (percent):					
1952 prices:					
1952	100.0	4.7	12.7	22.5	60.1
1957	100.0	5.2	20.5	29.3	45.0
1965	100.0	7.9	25.8	35.7	30.6
1975	100.0	9.8	37.2	33.6	19.4
1979	100.0	9.3	35.5	36.3	18.9
1970 prices:					
1952	100.0	6.0	7.9	19.2	66.8
1957	100.0	7.1	13.8	24.8	54.8
1965	100.0	10.7	19.5	28.8	41.0
1975	100.0	13.5	30.5	27.8	28.2
1979	100.0	13.0	29.7	29.2	28.0
Rate of growth (precent):					
1952 prices:					
1952–1979	11.5	14.4	15.8	13.5	6.8
1952–1957	17.9	20.5	29.7	24.2	11.2
1957–1965	9.5	15.2	12.7	12.2	4.4
1965–1975	10.6	13.1	14.7	10.0	5.7
1975–1979	10.0	8.5	8.7	12.1	9.3
1970 prices:					
1952–1979	10.3	13.5	15.8	12.0	6.8
1952–1957	16.0	19.7	29.6	22.1	11.3
1957–1965	8.0	13.8	12.7	10.0	4.3
1965–1975	9.7	12.3	14.7	9.4	5.7
1975–1979	9.4	8.4	8.7	10.7	9.2

Note: The total excludes other industries; the light industries are food products, textiles and paper.

Sources: Derived from the GVIO data in table A1 and the price indexes in table 9.

During the Cultural Revolution (1966–1969), the industrial revival that had started in 1962 was interrupted by a new period of turmoil. Unlike the Leap Forward, the Cultural Revolution was not primarily an economic movement; nevertheless, it was the source of widespread, often violent, change that affected the performance of industry. Work stoppages, shortages of raw materials, and disruptions of transportation forced industrial production below the 1966 level in both 1967 and 1968. Thus the rapid growth since 1952 has been achieved despite periods of political turmoil and serious economic disruption.

Finally, output figures by themselves do not show the low level of efficiency at which Chinese industry operates. In the absence of more comprehensive data, series for GVIO, the average annual number of workers and employees, and the value of fixed assets at original purchase price are presented in Table 11, together with series for the productivity of labor and capital, and the capital/labor ratio. Fixed assets have grown slightly faster than output over the period as a whole and very much faster between 1957 and 1965. These relative rates have resulted in a decline in the average productivity of capital. Although data on fixed assets by branch of industry are not available for any recent year, some of the decline is the result of the substantial shift in the structure of industry. It is clear, however, that fixed assets have not been allocated properly and are not used efficiently. Their allocation has been handled by an essentially bureaucratic process with no strong incentive—at least until recently—for managers to use them intensively.

TABLE 11.—CHINA: OUTPUT, WORKERS AND EMPLOYEES AND FIXED ASSETS AT STATE-OPERATED INDUSTRIAL ENTERPRISES

	GVIO (million 1970 yuan)	Average annual number of workers and employees (thousand)	Fixed assets at original purchase price (million yuan)	GVIO per worker and employee (yuan)	Output per 1,000 yuan of fixed assets (yuan)	Fixed assets per worker worker and employee (yuan)
1952	19, 954	4, 789	14, 920	4, 167	1, 337	3, 115
1957	46, 544	7, 346	33, 660	6, 336	1, 383	4, 582
1965	101, 892	11, 393	104, 000	8, 943	980	9, 128
1975	255, 154	25, 531	242, 830	9, 994	1, 051	9, 511
1979	357, 040	30, 283	246, 670	11, 790	1, 030	11, 448
Rate of growth (percent):						
1952–79	11. 3	7. 1	12. 4	3. 9	−1. 0	4. 9
1952–57	18. 5	8. 9	17. 7	8. 7	0. 7	8. 0
1957–65	10. 3	5. 6	15. 1	4. 4	−4. 2	7. 1
1965–75	9. 6	8. 4	8. 8	1. 1	0. 7	0. 4
1975–79	8. 8	4. 4	9. 3	4. 2	−0. 5	4. 7

Source: Table A4.

Before turning to the series for labor productivity and the capital/labor ratio, a word needs to be said about the value of fixed assets. The figures are for the yearend stock of fixed assets valued at whatever price was paid when the asset was originally purchased. As the great bulk of assets put in place over the last 30 years are of Chinese origin and as the exfactory prices of machinery and equipment have declined substantially,[14] the real value of fixed assets has certainly grown more rapidly than the series valued at original purchase price. But this only strengthens the conclusion reached above.

The rapid increase in fixed assets has meant that the capital/labor ratio has risen substantially in each period except 1965–1975—when the growth of fixed assets fell and the growth of workers and employees was high in relation to output—and has nearly quadrupled since 1952. Data on the productivity of labor and the capital/labor ratio show the same pattern of rapid growth during the First Five-Year Plan period and slower growth since then—with almost no growth during 1965–1975. As with fixed assets, it is not possible to look at productivity by branch of industry, but the growth of labor productivity clearly has been much more the result of the greater availability of capital than the efficiency with which labor is used. Thus the substantial growth of industry over the years has been achieved by pouring in capital and labor rather than by increasing factor productivity. The current low level of efficiency is one of the serious problems that the Chinese are attempting to solve in the process of economic reform.

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[14] Prices of machinery in 1970 were 39.6 percent and 22.5 percent below those of 1952 and 1957, respectively. See Table 9.

APPENDIX A

STATISTICAL TABLES

TABLE A1.—CHINA: GROSS VALUE OF INDUSTRIAL OUTPUT, BY BRANCH OF INDUSTRY

	Million 1952 yuan		Million 1957 yuan		Million 1970 yuan			
	1952	1957	1957	1965	1975	1977	1978	1979
Total	34,330	78,400	70,400	139,390	321,880	372,828	423,075	459,070
Metallurgy	2,020	7,260	6,000	14,950	28,830	29,052	36,891	41,027
Electric power	430	1,090	1,170	4,310	12,470	14,135	16,142	17,672
Coal	830	1,830	2,060	3,600	9,000	10,312	11,685	11,808
Of which: Extraction						10,191	11,001	11,624
Petroleum	180	740	800	4,510	17,980	22,680	23,329	24,957
Of which: Petroleum and natural gas extraction						8,394	9,480	9,803
Chemicals	1,660	6,460	4,820	17,940	36,450	42,366	52,498	56,184
Of which:								
Basic chemicals						5,161	6,167	7,221
Chemical fertilizers and insecticides	37	230	163	2,620	6,140	8,083	10,200	10,690
Rubber and plastics for productive use						8,664	10,240	11,175
Chemical pharmaceuticals (and chemicals for daily use)						8,785	9,981	10,011
Machinery	3,900	14,300	11,900	31,020	89,050	103,710	115,546	124,484
Of which:								
Agricultural machinery	87	380	281	1,430	8,230	10,676	11,588	10,913
Industrial equipment						22,392	25,541	24,027
Communication equipment						11,183	12,720	14,542
Construction and road construction machinery						507	553	826
Machinery for nonproductive use						4,365	5,107	6,040
Building materials	1,030	2,560	2,270	3,960	9,995	13,334	15,391	16,732
Of which:								
Cement and cement products						4,122	4,877	6,003
Refractory materials, ceramic brick, lime, etc						6,964	8,071	8,119
Glass						1,056	1,167	1,278
Nonmetallic minerals						1,192	1,276	1,332
Timber	2,230	4,240	4,060	3,990	6,110	7,000	7,741	8,475
Of which: Logging and transport						2,703	2,805	2,976
Food processing	8,280	15,360	13,840	17,550	38,610	43,574	47,171	51,872
Textiles	9,430	14,250	14,360	22,070	39,610	46,065	52,909	59,306
Of which: Chemical fibers						2,265	3,129	3,781
Paper	760	1,820	1,540	2,450	4,140	4,754	5,384	6,030
Other	3,580	8,490	7,580	13,040	29,640	35,846	38,388	40,523

Note: The 78,400,000,000 yuan reported for 1957 is stated to be in 1957 prices. As this figure is the same as that calculated for 1957 using the reported 1952 total and the reported index, it is assumed in fact to be 1952 prices.

Sources: United Nations Statistical Office. Zhongguo jingji nianjian (1981) (Annual Economic Report of China [1981]), Xue Muqiao, et al., eds., Beijing, 1981, p. VI–14.

TABLE A2.—CHINA: OUTPUT OF INDUSTRIAL COMMODITIES

	Units	1952	1957	1965	1975	1977	1978	1979
METALLURGY								
Pig iron	Thousand ton	1, 929	5, 936	10, 770	24, 490	25, 050	34, 790	36, 730
Of which: Pig iron for steel making	do					15, 640	21, 740	22, 590
Steel	do	1, 349	5, 350	12, 230	23, 900	23, 740	31, 780	34, 480
Of which: Steel casting	do					1, 890	2, 260	2, 330
Rolled steel	do	1, 060	4, 150	8, 810	16, 220	16, 330	22, 080	24, 970
Of which:								
Medium and thick steel plates	do					2, 190	3, 410	3, 140
Thin steel plates	do					970	1, 350	1, 690
Seamless steel pipes	do					630	810	910
Welded steel pipes	do					650	870	890
Coke (machine made)	do	2, 220	5, 550	12, 030	27, 380	26, 830	32, 380	33, 540
ELECTRIC POWER								
Electricity	Million kilowatt-hour.	7, 260	19, 340	67, 600	195, 800	223, 400	256, 550	281, 950
Of which: Hydro-electricity	do	1, 300	4, 800	10, 400	47, 600			50, 100
FUELS								
Coal	Thousand ton	66, 490	131, 000	232, 000	482, 000	550, 000	618, 000	635, 000
Of which: Brown coal	do					23, 000	25, 000	25, 000
Crude oil	do	436	1, 458	11, 310	77, 060	93, 640	104, 050	106, 150
Crude oil refined	do	(510)	(1, 730)	(10, 490)	(52, 400)	63, 000	70, 700	71, 460
Diesel oil	do					16, 160	18, 260	18, 730
Kerosene	do					3, 470	3, 560	4, 090
Natural gas	Million cubic meter.	8	70	1, 100	8, 850	12, 100	13, 700	14, 500
CHEMICALS								
Basic chemicals:								
Sulphuric acid	Thousand ton	190	632	2, 340	4, 847	5, 375	6, 610	6, 998
Hydrochloric acid	do					962	1, 115	1, 078
Soda ash	do	192	506	882	1, 243	1, 077	1, 329	1, 466
Caustic soda		79	198	556	1, 289	1, 386	1, 640	1, 826
Calcium carbide	do	11	49	440	983	989	1, 238	1, 407
Fertilizer and insecticides:								
Synthetic ammonia	do	38	153	1, 484	6, 077			13, 482
Chemical fertilizer	do	39	151	1, 726	5, 247	7, 238	8, 693	10, 654
Of which:								
Nitrogenous fertilizer	do	39	129	1, 037	3, 709	5, 509	7, 639	8, 821
Phosphate fertilizer	do		22	688	1, 531	1, 708	1, 033	1, 817
Potash fertilizer	do					21	21	16
Chemical insecticides	do	2	65	193	422	457	533	537
Rubber and plastics:								
Synthetic rubber	do					78	102	121
Tires	Thousand	420	880	2, 320	7, 000	7, 720	9, 360	11, 690
Rubber shoes	Million pair.	60	130	250	360			360
Ethylene	Thousand ton					303	380	435
Plastics	do	2	13	97	330	524	679	793
Of which:								
Polyvinyl chloride	do					185	256	332
Polyethylene	do					198	244	263
Polypropylene	do					57	72	75
Polystyrene	do					10	12	14
Pharmaceuticals: Chemical pharmaceuticals	Ton	100	2, 200	10, 500	27, 300	35, 000	41, 000	42, 000
Other:								
Iron pyrites	Thousand ton					6, 590	6, 868	6, 337
Synthetic fatty acid	Ton			8, 671	47, 064			58, 422
Synthetic detergents	Thousand ton			30	223	257	324	397
Soap	do	97	263	315	611	551	596	753
MACHINERY								
Agricultural equipment:								
Tractors	Unit			9, 600	78, 400	99, 300	113, 500	125, 600
Hand tractors	do			3, 600	209, 400	320, 500	324, 200	317, 500
Combine harvesters	do		124	655	2, 484			4, 587

See footnotes at end of table.

TABLE A2.—CHINA: OUTPUT OF INDUSTRIAL COMMODITIES—Continued

	Units	1952	1957	1965	1975	1977	1978	1979
MACHINERY—Contiuued								
Industrial equipment:								
Power generating equipment	Thousand kilowatt.	6	198	683	4,965	3,181	4,838	6,212
Of which:								
Hydraulic turbogenerators.	do	6	75	(225)	(1,241)	626	1,446	1,717
Steam turbogenerators.	do	0	123	(458)	(3,724)	2,554	3,387	4,495
Power machinery	Thousand horsepower.	35	690	...	...	...	...	...
Of which:								
Steam engines	do	7	81	...	...	...	...	...
Internal combustion engines.	do	28	609	2,790	23,480	27,410	28,180	29,080
Of which: For irrigation use.	do	...	265	663	10,282	...	...	6,542
Of which:								
Diesel engines.	do	18	...	...	...	22,980	23,320	22,960
Gasoline engines.	do	10	...	...	...	4,430	4,860	6,120
Alternating current motors	Thousand kilowatt.	639	1,455	4,050	27,990	26,956	31,948	35,632
Transformers	Thousand kilovolt-ampere.	1,170	4,200	8,180	40,970	35,810	48,620	58,230
Pumps	Thousand	14	51	155	1,188	...	...	1,256
Machine tools	do	14	28	40	175	199	183	140
Of which:								
Lathes	do	...	...	...	...	84	80	58
Grinding machines	do	...	...	...	...	20	21	20
Milling machines	do	...	...	...	...	15	13	12
Planing machines	do	...	...	...	...	26	21	11
Mining equipment	Ton	1,800	52,500	40,000	196,100	184,500	242,500	263,700
Forging equipment	do	1,100	2,900	7,500	44,700	...	...	36,000
Metallurgical equipment	do	200	13,800	17,400	82,100	...	...	72,900
Petroleum equipment	do	...	5,900	12,900	63,200	...	...	93,000
Chemical equipment	do	1,000	7,200	34,200	75,900	...	...	66,400
TRANSPORT EQUIPMENT								
Motor vehicles	Unit	...	7,900	40,500	139,800	125,400	149,100	185,700
Of which: Trucks	do	...	6,200	26,500	77,600	75,900	96,100	116,700
Locomotives	do	20	167	146	526	293	521	573
Of which:								
Steam locomotives	do	20	167	(91)	(310)	(167)	(281)	311
Diesel locomotives	do	...	...	(55)	(200)	(108)	(204)	222
Electric locomotives	do	...	...	...	(16)	(18)	(36)	40
Freight cars	do	5,800	7,300	2,900	15,700	6,396	16,950	16,042
Passenger coaches	do	6	454	160	804	538	784	856
Merchant vessels	do	84	646	517	1,605	...	...	2,771
Full load	Ton	21,485	108,000	...	...	...	...	...
Dead weight	do	16,000	54,000	...	...	634,300	860,700	809,300
Light ship	do	5,485	54,000	(73,100)	(494,200)	(431,300)	(585,300)	(550,324)
OTHER								
Radio sets:	Thousand	17	352	815	9,356	10,494	11,677	13,807
Of whch: Transistor sets	do	...	...	...	...	10,133	11,154	13,331
Television sets	Unit	...	...	4,300	177,800	284,600	517,300	1,328,500
Tap recorders	Thousand	...	...	...	...	...	...	165
Cameras	Unit	...	100	17,200	184,900	246,600	178,900	238,100
Sewing machines	Thousand	66	278	1,238	3,567	4,242	4,865	5,868
Bicycles	do	80	806	1,838	6,232	7,430	8,540	10,090
Wrist watch	do	...	...	1,008	7,822	11,040	13,510	17,070
Light bulbs	Million	26	69	192	520	617	759	850
Roller bearings	Thousand set.	1,180	10,600	30,800	162,730	164,780	179,320	215,180
BUILDING MATERIALS								
Cement	Thousand ton.	2,860	6,860	16,340	46,260	55,650	65,240	73,900
Glass: Plate glass	Thousand case.	2,130	4,620	6,870	14,530	16,970	20,040	23,300
Other:								
Bricks	Million	...	...	...	...	93,800	110,000	128,500
Tiles	do	...	...	...	...	16,000	22,100	24,800
Asbestos	Thousand ton.	...	...	...	...	139	143	141
Timber	Thousand cubic meter.	11,200	27,870	39,780	46,260	49,670	51,620	54,390

See footnotes at end of table.

TABLE A2.—CHINA: OUTPUT OF INDUSTRIAL COMMODITIES—Continued

	Units	1952	1957	1965	1975	1977	1978	1979
FOOD PRODUCTS								
Salt	Thousand ton	4, 945	8, 277	11, 470	14, 810	17, 100	19, 530	14, 770
Canned food	Ton	12, 500	61, 800	121, 800	350, 900	442, 000	488, 000	501, 300
Sugar	Thousand ton	451	864	1, 460	1, 740	1, 816	2, 267	2, 500
Cigarettes	Thousand crate	2, 650	4, 456	4, 780	9, 920		11, 820	13, 030
Dairy products	Ton	624	10, 863					42, 590
TEXTILES								
Chemical fibers	do		200	50, 100	154, 800	189, 800	284, 600	326, 300
Of which:								
Artificial fibers	do					84, 100	115, 200	112, 700
Synthetic fibers	do					105, 700	169, 400	213, 600
Other:								
Cotton yarn	Thousand ton	656	844	1, 300	2, 108	2, 230	2, 380	2, 635
Cotton cloth	Million meter	3, 830	5, 050	6, 280	9, 400	10, 151	11, 029	12, 150
Wool yarn	Ton	2, 000	5, 700	11, 000	26, 600	31, 100	37, 800	44, 400
Wool cloth	Thousand meter	4, 230	18, 170	42, 400	69, 430	78, 400	88, 850	90, 170
Wool blankets	Thousand	717	862	2, 420	5, 130	5, 350	6, 250	6, 900
Gunny sacks	Million	67	83	125	191	245	290	344
Silk	Ton	5, 600	9, 900	9, 100	23, 100	26, 900	29, 700	29, 700
Silk cloth	Million meter	65	145	342	454	529	611	663
Towels	Million	224	368	434	767			1, 090
Socks	Million pair	359	583	434	592			817
SEWN GOODS, AND FUR AND LEATHER								
Clothing	Million piece			385	673	717	673	744
Pelts	Thousand	3, 300	9, 560	7, 130	24, 570			30, 830
Leather shoes and boots	Thousand pair	12, 000	25, 290	18, 080	66, 460	91, 190	100, 530	116, 080
PAPERMAKING AND CULTURAL AND EDUCATIONAL GOODS								
Paper and paperboard	Thousand tons	539	1, 221	(1, 730)	(3, 410)	(3, 770)	(4, 390)	(4, 930)
Of which:								
Machine-made paper	do	372	913	1, 730	3, 410	3, 770	4, 390	4, 930
Of which:								
Newsprint	do					330	340	360
Paper for relief printing	do					360	440	510
Handmade		167	308					
OTHER								
Matches	Thousand	9, 110	10, 360	12, 070	16, 370			18, 920

Note: Figures in parentheses are estimated.

Sources:

General references:

United Nations Statistical Office. Zhongguo jingji nianjian (1981) (Annual Economic Report of China [1981]), Xue Muqiao, et al., eds., Beijing, 1981, pp. VI–15 and VI–16. State Statistical Bureau, Main Indicators, Development of the National Economy of the People's Republic of China, Beijing. 1980. State Statistical Bureau, Ten Great Years, Beijing 1960.

Specific references:

Hydraulic turbogenerators, 1957: Dianji gongye (Electrical Industry), No. 10, 1957, p. 6. Steam turbogenerators, 1957: Derived as the residual. Steam engines: 1952: State Statistical Bureau, Woguo gangtie dianli meitan jixie fangzhi zaozhi gongye di jinxi (Chinese Iron and Steel, Electric Power, Coal, Machinery, Textiles, and Paper Industries—Past and Present), Beijing, 1958, p. 142. 1957: Derived as the residual.

Internal combustion engines: 1952: State Statistical Bureau, Past and Present, p. 123. 1957: State Statistical Bureau,, Communique on the Fulfillment of the First Five-Year Plan (1953–1957) for the Development of the National Economyd Beijing, 1959. Diesel engines, 1952: State Statistical Bureau, Past and Present, p. 114. Gasoline engines, 1952: Deriveit as the residual. Steam locomotives, 1979: Economic Reporter, October 1980, p. 30. Diesel locomotives, 1979: Loc. c . Electric locomotives, 1979: Loc. cit.

Merchant vessels: Full load, 1952: State Statistical Bureau, Past and Present, p. 123. Light ship, 1952 and 1957: Derived as the residual. Cigarettes, 1978: Zhongguo baike nianjian 1980 (1980 Yearbook of the Chinese Encyclopedia), Beijing, 1981, p. 314. Dairy Products: 1952 and 1957: Kang Chao, The Rate and Pattern of Industrial Growth in Communist China, Ann Arbor, 1965. 1979: BBC, FE/W1038/A/10, September 3, 1980. Paper, hand-made, 1952 and 1957: Derived as the residual.

TABLE A3.—CHINA: PRICES OF SELECTED INDUSTRIAL COMMODITIES, 1952 AND 1957

[Yuan]

	Units	1952	1957
Metallurgy:			
Pig iron	Ton	163.3	154.00
Crude steel	Ton	578.20	404.70
Rolled steel	Ton	800.0	560.00
Coke	Ton	31.20	44.50
Basic chemicals:			
Sulfuric acid	Ton	316.00	257.00
Soda ash	Ton	348.00	200.00
Caustic soda	Ton	1,075.00	735.00
Calcium carbide	Ton	630.46	
Industrial equipment:			
Hydraulic turbogenerators	Kilowatt	120.68	53.62
Steam turbogenerators	Kilowatt	95.04	91.67
Internal combustion engines	Horsepower	150.00	147.98
Alternating current motors	Kolowatt	150.30	96.21
Transformers	Kilovoltampere	41.60	25.99
Machine tools	Unit	12,900.00	10,200.00
Transport equipment:			
Trucks	Unit		18,000.00
Steam locomotives	Unit	252,831.00	251,900.00
Diesel locomotives	Unit		756,800.00
Freight cars	Unit	22,313.66	19,389.00
Passenger coaches	Unit	42,680.00	37,085.92
Merchant vessels	Leased ton	3,336.00	3,028.00
Food products:			
Salt	Ton	188.00	191.00
Sugar	Ton	1,102.00	990.00
Cigarettes	Crate	400.00	480.00
Dairy products	Ton	6,570.00	
Textiles:			
Cotton yarn	Ton	3,822.50	
Cotton cloth	Thousand meter	738.00	725.00
Wool yarn	Ton	33,950.00	
Wool cloth	Meter	8.54	
Wool blankets	Unit	118.00	
Gunny sacks	Unit	2.27	
Silk	Ton	43,910.00	
Silk cloth	Meter	5.46	

Sources: Calcium carbide 1952: Assumed to equal the weighted average of the prices of the other basic chemicals. Passenger coaches 1957: The 1952 price deflated by the price relative for freight cars. All other prices: K.C. Yeh, "Gross National Product of the People's Republic of China, 1952-1957, Rand Corp. forthcoming. C.I.A., "Prices of Machinery and Equipment in the People's Republic of China, A (ER) 75-64, May 1975. Kang Chao, "The Rate and Pattern of Industrial Growth in Communist China," Ann Arbor, 1965.

TABLE A4.—CHINA: ESTIMATION OF THE GROSS VALUE OF OUTPUT AND THE AVERAGE ANNUAL NUMBER OF WORKERS AND EMPLOYEES AT STATE-OPERATED ENTERPRISES

	1952	1957	1965	1975	1979
Profit (billion current yuan)	2.83	7.95	21.70	36.34	56.28
Profit per 100 yuan GVIO	14.2	17.1	21.3	14.2	15.8
GVIO (billion 1970 yuan):					
Minimum	19.839	46.219	101.426	254.269	354.154
Maximum	20.064	46.680	102.160	256.883	357.390
Fixed assets at original purchase price (billion yuan)	14.92	33.66	104.00	242.83	346.67
GVIO per 100 yuan fixed assets at original purchase price	134	138	98	105	103
GVIO (billion 1970 yuan):					
Minimum	19.912	46.276	101.395	253.752	355.332
Maximum	20.139	46.766	102.865	257.167	360.199
Circulating capital (billion current yuan)	4.60	9.05	26.01	85.27	110.90
Circulating capital per 100 yuan GVIO	23.1	19.4	25.5	33.4	31.0
GVIO (billion 1970 yuan):					
Minimum	19.815	46.408	101.623	254.598	356.690
Maximum	19.996	46.817	102.235	255.709	358.349
Estimated GVIO (billion 1970 yuan)	19.954	46.544	101.892	255.154	357.040
GVIO per worker and employee (1970 yuan)	4,167	6,336	8,943	9,994	11,790
Estimated average annual number of workers and employees (thousand)	4,789	7,346	11,393	25,531	30,283

Note: Estimated GVIO is the midrange of values derived from the 3 sets of data in the table; estimated average annual number of workers and employees is derived from the estimated GVIO and the reported GVIO per worker and employee.

Source: "Zhongguo jingji nianjian (1981)" ("Annual Economic Report of China [1981]"), Xue Muqiao et al., eds., Beijing, 1981, p. VI-18.

APPENDIX B

THE BRANCH OF INDUSTRY CLASSIFICATION LIST[18]

CONTENTS

Methods of Demarcating Light and Heavy Industry.
Several Points of Explanation of the Branch of Industry Classification List.
Branch of Industry Classification List.
  I. Metallurgical Industry.
  II. Electric Power Industry.
  III. Fuels Industry.
  IV. Chemicals Industry.
  V. Machinery Industry.
  VI. Building Materials Industry.
  VII. Timber Industry.
  VIII. Food Products Industry.
  IX. Textile, Sewn Goods, and Fur and Leather Industries.
  X. Paper Making, and Cultural and Educational Use Goods Industries.
  XI. Other Industries.

METHODS OF DEMARCATING LIGHT AND HEAVY INDUSTRY

Heavy industry in general indicates industry that produces production materials. It is the industry that supplies the material (*wuzhi*) base for realizing the modernization of agriculture, industry, national defense, and science and technology. It is the base for establishing strong economic power and national defense power in our country, and is an important indicator of socialist industrialization.

Heavy industry includes the three following classes of industry:

(1) Extractive (logging) industry: that is, industries that exploit petroleum, coal, metallic ores, nonmetallic ores, and timber;

(2) Raw materials industry: industries that supply the raw materials, power, and fuels needed by manufacturing industry. The products of this type industry are the most important material (*wuzhi*) components of industrial working capital. It includes industries that refine and process metals, coking and coke chemistry, and production of chemical raw materials, cement, sawn timber and particle boards, electricity, and processing of petroleum, coal, and other fuels;

(3) Manufacturing industry: it consists primarily of industries which manufacture modern production tools. In general the products of this class of industry are the final products of heavy industry. It includes industries that manufacture agricultural machinery, equipment for industries, modern communications tools, building and installation work machinery and equipment, and metal structures and cement products [used] in construction work sites (factories, railways, etc.), and finally industries that manufacture fertilizer and agricultural pesticides.

Light industry in general refers to industries that supply household consumption items and manufacture hand tools. It has extensive and close connections with agricultural sideline production undertaken by the vast peasant [masses] and the livelihood of urban and rural people.

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[18] (State Statistical Bureau). Gongye bumen fenlei (Branch of Industry Classification List), (Beijing), (1978); translated by John Philip Emerson.

In general it is characterized by a comparatively rapid return on capital and a comparatively short period of time for construction.

Light industry includes the two following classes of industry:

(1) Light industry that uses agricultural products as raw materials, including cotton, woolen, hempen, and silk textiles and sewn goods, leather, fur, and their finished products, pulp and paper, and the food products industries.

(2) Light industry that uses nonagricultural products as raw materials, including industries that make daily use metal products, daily use chemical products, plastics, and weaving of plastic fibers, salt, daily use glass, ceramics, fuels for household use, small farm tools made of iron, bamboo and wooden farm tools, craftsmen's tools, and other hand tools.

According to the above principles of classification, industries that produce weapons, equipment, and ammunition should be classified as heavy industry; industries that produce military consumer products, on the other hand, should be classified as light industry. Under repair, if the objects to be repaired are heavy industry products, the repair should be classified as heavy industry, if not, as light industry.

Light and heavy industry are divided into branches of industry. For details of branches of industry include under light and heavy industry, see "Branch of industry classification list."

SEVERAL POINTS OF EXPLANATION OF THE "BRANCH OF INDUSTRY CLASSIFICATION LIST"

1. When enterprises are being classified by branch of industry, on the basis of the nature of the principal product under [conditions of] normal production, the entire plant is classified under one single subcategory. Enterprises whose production is temporarily changed, or newly built enterprises, take their production mix as the [classification] norm. Enterprises whose production mix has not been settled can decide [on a classification subcategory] on the basis of the nature of the principal product for that year. Some local enterprises with production of an unusual nature, on the basis of the nature of concrete production, are classified under kindred subcategories by provincial, municipal, and autonomous region planning and statistical departments.

2. The designations of a given branch of industry (or subcategory) under heavy industry as "extractive (logging) industry," "raw material industry," or "manufacturing industry," or for light industry branches as "industry that uses agricultural products as raw materials" and "industry that uses nonagricultural products as raw materials" are all noted in the "Branch of industry classification list," according to these methods of demarcating light and heavy industry and based on the general conditions of enterprises throughout the country. If a given branch of industry (or subcategory is listed under "raw materials industry," the enterprises of that branch all fall under "raw materials industry." For example, electric power plants all are listed under "raw materials industry," regardless of whether the plants produce electricity principally for industrial use or for consumer use by individuals. Salt refineries all are classified as light industry that "uses

nonagricultural products as raw materials," regardless of whether their products are industrial salts or edible salt.

3. In general branches of industry (or subcategories [all] include manufacturing and repair. For example, the timber processing industry includes manufacture and repair of timber articles. But in order to examine the relative shares of output of manufacturing and repair in the machinery industry, machinery repair is taken as a separate branch of industry.

4. Classification of military industry enterprises can be decided according to the nature of their industrial production.

BRANCH OF INDUSTRY CLASSIFICATION LIST

Branch of industry	Subcategory	Heavy or light	Notes
I. METALLURGICAL INDUSTRY			
1. Ferrous metals industry.			
	1. Ferrous metals ore extracting and dressing	Heavy (extractive)	Includes manganese and chromite ores. Does not include iron pyrites.
	2. Ferrous metals refining and processing	Heavy (raw).	
2. Nonferrous metals industry.			
	1. Nonferrous ore extraction and dressing	Heavy (extractive).	
	2. Nonferrous metals refining and processing	Heavy (raw)	Does not include mining of coins.
II. ELECTRIC POWER INDUSTRY			
3. Thermal power		do.	The electric power industry includes thermal electric powerplants.
4. Hydroelectric power		do.	
5. Power supply [distribution]		do.	
III. FUELS INDUSTRY			
6. Coal industry.			
	1. Coal extraction	Heavy (extractive).	
	2. Coal washing and dressing	Heavy (raw)	Refers to independent washing and dressing plant.
7. Petroleum industry			Includes natural and synthetic oils.
	1. Petroleum extraction	Heavy (extractive)	Includes natural gas.
	2. Petroleum processing	Heavy (raw).	
8. Coking and coke chemistry industry		do.	Includes coal gas.
IV. CHEMICAL INDUSTRY			
9. Chemical ore extraction industry		Heavy (extractive)	Includes iron pyrites, phosphorus, natural potassium salts, borate, and other chemical minerals. Does not include limestone, gypsum, potash, feldspar, white clay, kaolin, or other nonmetallic ores or fluorspar.
10. Basic chemicals raw materials industry		Heavy (raw)	Includes acids, salts, chlorine, alkalis, and other inorganic chemical industry raw materials. Does not include explosives, percussion caps, fuses, or other explosive products.

11. Fertilizer and agricultural pesticides.			
	1. Chemical fertilizer	Heavy (manufacturing)	Does not include bone meal or bone phosphate.
	2. Agricultural pesticides	do.	Includes basic chemical pesticides and other chemical preparations.
12. Organic chemical industry			
	1. Organic chemical synthetic raw materials	Heavy (raw)	Includes plastics, synthetic fiber elements (polymers) and synthetic rubber. Does not include synthetic rubber products or plastic products.
	2. Dyes and mordants	Light (nonagricultural)	Does not include synthetic rubber products or plastic products.
	3. Paints and varnishes	do.	Does not include spraying of lampblack or paints.
	4. Chemical reagents	Heavy (raw)	Includes high purity grade reagents, standard reagents, biological reagents, and organic and inorganic reagents.
	5. Other organic chemical raw materials	do.	
13. Pharmaceutical industry			Does not include the processing or refining of [traditional] Chinese material medica.
	1. Pharmaceutical raw materials	Light (nonagricultural).	
	2. Medical pharmaceuticals	do.	Includes cod liver oil and other nutritional products.
	3. Veterinary pharmaceuticals	do.	
14. Daily use chemical industry.			
	1. Photochemistry	do.	Includes camera plates and film.
	2. Fats, soap, and natural oils	do.	Includes toilet soap.
	3. Detergents and synthetic fatty acids	do.	
15. Rubber processing industry.			
	1. Rubber products for production use	Heavy (manufacturing)	Includes tire retreading.
	2. Rubber products for household use	Light (nonagricultural).	
16. Plastics processing industry.			
	1. Plastic products for production use	Heavy (manufacturing)	Includes artificial leather and products. Does not include artificial leather shoes.
	2. Plastic products for household use	Light (nonagricultural)	Does not include ping-pong balls.
V. MACHINERY INDUSTRY			Machinery manufacturing industry subcategories 17–21 below all include specialized castings, forgings, equipment, accessories, and spare parts of these industry groups.
17. Agricultural machinery manufacturing industry			Does not include grain processing and oil pressing machinery, or motor-driven fishing boats.
	1. Tractor manufacturing	Heavy (manufacturing)	Includes tractors of all kinds and hand-held tractors [sic] [cultivators].
	2. Mechanized agricultural tool manufacturing	do.	
	3. Semimechanized agricultural tool manufacturing	do.	
	4. Improved tool manufacturing	Light (nonagricultural).	

See footnote at end of table.

BRANCH OF INDUSTRY CLASSIFICATION LIST—Continued

Branch of industry	Subcategory	Heavy or light	Notes
V. MACHINERY INDUSTRY—Continued			
18. Industrial equipment manufacturing industry.			
	1. Power machinery manufacturing	Heavy (manufacturing)	Includes manufacturing of steam boilers, prime movers, and electrical machinery and equipment. Does not include electrical meters, electrical instruments or [traditional] stoves for boiling water.
	2. Machine tool and forging equipment manufacturing	do	Includes casting machinery.
	3. Mining and coal industry specialized equipment manufacturing.	do	Does not include specialized ore dressing laboratory equipment.
	4. Petroleum industry specialized equipment manufacturing.	do.	
	5. Metallurgical industry specialized equipment manufacturing.	do.	
	6. Chemical industry specialized equipment manufacturing.	do.	
	7. Rubber and plastics industry specialized equipment manufacturing.	do	Does not include synthetic rubber equipment.
	8. Construction materials industry specialized equipment manufacturing.	do.	
	9. Timber industry specialized equipment manufacturing	do	Does not include tractors for forest use.
	10. Grain and oil industry specialized equipment manufacturing.	do.	
	11. Food products industry specialized equipment manufacturing.	do.	
	12. Textile industry specialized equipment manufacturing	do.	
	13. Papermaking industry specialized equipment manufacturing.	do.	
	14. Specialized equipment manufacturing for other industries.	do	Specialized equipment for other industries in addition to those listed above. Does not include sewing machines for home use.
19. Communications equipment manufacturing industry.			Does not include bicycles.
	1. Motor vehicle manufacturing	Heavy (manufacturing)	Includes rebuilt cars, trailers, and motorcycles.
	2. Railway transport equipment manufacturing	do	Includes railway locomotives and rolling stock, railway tools and equipment, and signal equipment. Does not include rolling stock of logging, mining, and industrial railways.
	3. Shipbuilding	do	Includes work vessels [sic] (gongcheng quan), repair ships, auxiliary engines for shipboard use, marine navigational and diving equipment. Does not include motorized or sailing fishing vessels, cement vessels, or wooden vessels.
	4. Tram manufacturing	do	Includes tram rolling stock.
20. Construction and road building machinery manufacturing industry.		do	Does not include excavating machinery.
21. Industry manufacturing other machinery for production use.			
	1. Geological prospecting equipment manufacturing	Heavy (manufacturing)	Does not include oil well drilling equipment.
	2. Instrument and meter manufacturing	do	Includes electrical meters and instruments, thermo-

			dynamic meters, optical instruments, petroleum geology instruments and meters, telecommunications instruments and meters, textile instruments, instruments and meters for shipboard use, meteorological instruments educational instruments, and other instruments, meters, and scales. Does not include motor vehicle and tractor meters or medical use instruments and meters.
	3. Manufacturing equipment	do	Includes lifting and transporting equipment, industrial and mining rolling stock, pumps, ancmometers, gas compression engines, refrigerating equipment, safety and firefighting equipment. Does not include popsicle machines, scales, and pole scales.
	4. Other manufacturing of machinery for production use	do.	
22. Electronics industry.			
	1. Production of integrated sets for production use	Heavy (manufacturing)	Includes all kinds of integrated radio sets [sic] (wuxiandian zhengji 3541, 4775, 7193, 2419, 2894), such as electronic calculators, broadcasting and television equipment communications equipment, electronic assemblies for industrial use and electronic assemblies for military use.
	2. Integrated sets for cultural and household use	Light (manufacturing) [sic]	Includes television sets, record players, and [radio] receivers.
	3. Radio parts	Heavy (manufacturing)	Includes electronic tube and semiconducior parts and elements.
	4. Radio measuring instruments	do	Includes power, frequency, and time measuring instruments, oscilloscopes, voltameters, power supply signal generators, acoustical measuring instruments, complex testing apparatus, and other radio testings, instruments.
	5. Specialized radio equipment	do	Includes specialized semiconductor equipment, special use vacuum tube equipment, special use parts and elements, and other special use radio equipment.
23. Household use machinery manufacturing industry.			
	1. Daily use machinery	Light (nonagricultural)	Includes bicycles, home use sewing machines, timepieces and washing machines.
	2. Medical machinery	do	Does not include glass instruments.
	3. Machinery for cultural use	do	Includes cameras, record players, motion picture machines, and slide projectors.
	4. Other machinery for household use	do	Includes calculators, typewriters, and high speed presses.
24. Production use metal products industry.			
	1. Metal structures	Heavy (manufacturing).	
	2. Tools	do	Includes measuring and cutting tools. Does not include craftsmen's tools or small iron farm tools.
	3. Electrical ware and cable	do.	
	4. Metal products used in electrical [appliances]	do	Includes storage batteries, special use bulbs, and dry cell batteries for production use and mining lamps.
	5. Industrial use metal products	do	Includes roller bearings, valves, standard asteners, and enamel products for industrial use.
	6. Metal cables and products [sic]	do	Includes gardening tools and horseshoes.
	7. Small iron farm tools and craftmen's tools	Light (nonagricultural).	
	8. Metal products used in construction	do.	
	9. Other metal products for production use	do	Includes metal packing materials, containers, and electric welding rods. Does not include specialized geological metal products.

See footnote at end of table.

BRANCH OF INDUSTRY CLASSIFICATION LIST—Continued

Branch of industry	Subcategory	Heavy or light	Notes
V. MACHINERY INDUSTRY—Continued			
25. Daily use metal products industry.			
	1. Daily use electrical appliances	Light (nonagricultural)	Includes electric stoves, electric fans, electric refrigerators, flashlights and batteries, ordinary light bulbs, and small light bulbs.
	2. Enamel products for daily use	do.	
	3. Hardware for daily use	do.	Includes aluminum products, food vessels, for home use, and cooking utensils, knives, sicissors, locks, needles, and other metal products for daily use.
26. Machinery, equipment, and metal products repair industry.			Items 1 to 6 below are repair for production use.
	1. Agricultural machinery repair	Heavy (manufacturing).	
	2. Motor vehicle repair	do.	
	3. Railway and transport equipment repair	do.	
	4. Ship repair	do.	
	5. Repair of other equipment	do.	Includes industrial equipment, construction and road-building equipment, telecommunications equipment, and other production use machinery repair.
	6. Repair of metal products for production use	Light (nonagricultural).	
	7. Repair of machinery for household use	do.	
	8. Repair of metal products for household use	do.	
	9. Technical occupations	do.	Includes independent electroplating, metal spraying, stamping (yinhua 0803,5363) [sic], and grinding and polishing.
VI. BUILDING MATERIALS INDUSTRY			
27. Cement industry.			
	1. Cement	Heavy (raw).	
	2. Cement products	Heavy (manufacturing)	Includes asbestos-cement products.
28. Brick, tile, and lime, and other construction materials industry.			
	1. Brick, tile, and lime	Heavy (manufacturing)	Does not include cement brick, cement tile, glazed tile, and porcelain wall and floor brick.
	2. Gravel extraction	Heavy (extractive).	
	3. Other construction materials	Heavy (manufacturing)	Includes acidproof materials, linoleum, and oilpaper. Does not include clay pipe.
29. Fire-resistant materials industry.			
	1. Fire-resistant earth	Heavy (extractive)	Includes 6993, 6986, 4345, 5480, 9486, 4349, magnesite, dolomite, silica, and fluorite extraction.
	2. Fire-resistant materials products	Heavy (manufacturing).	
30. Glass industry.			
	1. Glass for construction use	Heavy (manufacturing).	
	2. Glass for industrial use	do.	Includes glass for electrical equipment, glass for optical use, and glass instruments.
	3. Glass fibers and products	Heavy (raw).	

31. Ceramics industry.			
	1. Ceramics for construction and health uses	Heavy (manufacturing)	Includes clay pipe for construction use.
	2. Ceramics for industrial and electrical uses	do.	
32. Nonmetallic ores industry.			
	1. Nonmetallic ore extraction and dressing	Heavy (extractive).	
	2. Nonmetallic ore processing	Heavy (raw)	Does not include stone sculpture for display [exhibition].
VII. TIMBER INDUSTRY			
33. Timber felling and transport industry		Heavy (extractive)	Includes felling and transport of bamboo.
34. Timber processing industry.			
	1. Sawn and synthetic lumber	Heavy (raw)	Includes plywood.
	2. Wood products for production use	Light (nonagricultural)	Includes cork products for production use.
	3. Wood products for household use	do	Includes cork products for household use.
35. Wood products chemistry industry		Heavy (raw)	Includes resins, gambier, camphor, and the distillation and carbonization of wood.
VIII. FOOD PRODUCTS INDUSTRY			
36. Grain and oil industry.			
	1. Rice hauling and grain milling	Light (agricultural).	
	2. Edible plant oils	do.	
	3. Oils and fats for industrial use	do	Includes animal and plant oils and their processing for nonfood use. Does not include synthetic fatty acids.
37. Salt industry.			
	1. Crude salt	Light (nonagricultural)	Includes evaporation of sea water and extraction of rock salt.
	2. Salt processing	do.	
	3. Salt chemical industry	do.	
38. Food products industry.			
	1. Butchering and meat processing	Light (agricultural)	Does not include bone dust or glue.
	2. Aquatic products processing	do	Includes salting and drying of aquatic products.
	3. Canning	do.	
	4. Sugar manufacturing	do	Includes raw sugar and sugar processing. Does not include malt sugar or candy.
	5. Tea manufacturing	do.	
	6. Cigarettes	do	Includes cigars, shredded tobacco, snuff, and water pipe tobacco.
	7. Tobacco curing	do.	
	8. Distilling	do.	
	9. Egg and milk products	do.	
	10. Other food products	do	Includes baked breads, pastries, sweetmeats, biscuits, cold drinks, condiments, icemaking, cold storage, and other food products.

See footnote at end of table.

BRANCH OF INDUSTRY CLASSIFICATION LIST—Continued

Branch of industry	Subcategory	Heavy or light	Notes
IX. TEXTILE, SEWN GOODS, AND FUR AND LEATHER INDUSTRIES			
39. Textile industry			Includes chemical fabrics.
	1. Chemical fiber industry:		
	(a) Artificial fibers	[sic].	
	(b) Synthetic fibers	[sic]	Does not include [manufacturing of] synthetic fiber elements.
	2. Preliminary processing of fiber raw materials:		
	(a) Cotton ginning	Light (agricultural)	Does not include cotton bowing.
	(b) Wool scouring and other fiber processing	do.	
	3. Cotton textiles:		
	(a) Cotton textiles for daily use	do.	Does not include knitted goods.
	(b) Cotton textiles for production use	do.	
	4. Wool textiles:		
	(a) Wool textiles for daily use	do.	Does not include rugs or felt products.
	(b) Wool tops and wool textiles for production use	do.	
	5. Hemp textiles:		
	(a) Hemp textiles for daily use	do.	
	(b) Hemp textiles for production use	do.	
	6. Silk textiles:		
	(a) Silk textiles for daily use	do.	
	(b) Silk reeling and knitted silk textiles for production use.	do.	
	7. Knitted goods	do.	Includes knitted goods of cotton, wool, hemp, silk, chemical fibers, and other raw materials.
	8. Other textile products:		
	(a) Other textile products for daily use	do.	Includes felt products.
	(b) Other textile products for production use	do.	Includes fishing lines and fishing nets.
40. Sewn goods industry.	1. Sewn goods for household use	Light (agricultural)	Does not include embroidery or pure fur or wool sewn goods.
	2. Sewn goods for production use	do.	
41. Fur and leather industry.	1. Tanning leather	Light (agricultural).	
	2. Fur and leather goods for household use	do.	Does not include leather sporting goods.
	3. Fur and leather goods for production use	do.	

X. PAPER MAKING AND EDUCATION GOODS

42. Paper making industry.	1. Paper pulp	Light (agricultural).	
	2. Machine made paper and cardboard	do.	
	3. Processing of paper	do.	Does not include tar paper, oilpaper, carbon, stencil paper, insulating paper and paper product:
	4. Chinese native paper	do.	
43. Industry manufacturing products for educational, cultural, and arts uses.	1. Printing	Light (agricultural)	Includes binding.
	2. Printing ink	do.	
	3. Writing utensils	do.	
	4. Products for educational, cultural, and sports uses	do.	Includes stationery, scientific and cultural samples and specimens, sports equipment, musical instruments. toys, records, film developing and printing. Does not include educational instruments.
	5. Industrial crafts and fine arts products	do.	Includes floor rugs, lace, embroidery, stage properties and other industrial crafts and fine arts products.

XI. OTHER INDUSTRIES

44. Other industries.	1. Explosive products	Heavy (manufacturing)	Includes high explosives, percussion caps, and fuses.
	2. Carbon products	do.	
	3. Insulating materials	do.	
	4. Matches	Light (nonagricultural).	
	5. Alcohol	do.	
	6. Piped water	do.	
	7. Processing and refining of Chinese materia medica	do.	
	8. Bamboo, rattan, coir palm, amd grass products:		
	(a) Bamboo, rattan, coir palm, and grass products for household use.	do.	
	(b) Bamboo, rattan, coir palm, and grass products for production use.	do.	
	9. Glass for daily use	[sic]	Includes hot water bottles and mirrors.
	10. Ceramics for daily use	[sic]	Includes earthenware.
	11. Other	[These] are mostly light industry.	Includes processing of fur, hair, bone, and horn, minting of coins, mixed animal feeds, paper products, cotton bowing, packing, wooden pole scales [balances], painting services, and briquettes.

Note: Heavy industry is divided into extractive (logging) industry (abbreviated "extractive"), raw materials industry (abbreviated "raw"); and manufacturing industry (abbreviated "manufacturing"); light industry is divided into industry that uses agricultural products as raw materials (abbreviated "agricultural") and industry that used nonagricultural products as raw materials (abbreviated "nonagricultural").

CHINA: AN ENERGY-CONSTRAINED MODEL OF INDUSTRIAL PERFORMANCE THROUGH 1985

By Robert Michael Field and Judith A. Flynn*

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I. INTRODUCTION

In the last four years, both Chinese and Western perceptions of industrial prospects in the People's Republic of China have changed drastically. At the National People's Congress in March 1978, the then Premier Hua Guofeng announced an ambitious ten-year plan for the modernization of the Chinese economy.[1] Production of steel was expected to grow from 25 million tons in 1977 to 60 million tons in 1985, and the gross value of industrial output was planned to increase ten percent annually.

The Chinese felt the planned 10-percent rate was attainable because they attributed the poor industrial performance during the previous several years (especially 1974 and 1976) to political turmoil. A province-by-province analysis of industrial performance during the period 1965–1977 shows clearly that political disruption did have a severe impact,[2] but the disruption obscured serious underlying economic problems such as poor planning, misallocation of capital, inefficient management and low productivity of labor. Many Western economists recognized at the time that the targets of the ten-year plan could not be fulfilled by 1985, but neither they nor the Chinese planners had enough data to understand fully the nature and scope of the problems.

Even as these limitations to growth were surfacing, a fundamental crack appeared in the foundation of China's modernization plan. Planners in Beijing—who were counting on continued high growth in oil output to fuel and finance the modernization program—found that oil prospects had been seriously overstated. In contrast to the anticipated 10-percent annual growth, they were faced with the prospect of a decline in output. This rapidly emerging problem has led us to examine the impact of energy shortages on industrial output over the next five years.

We explore the relationships between the availability of energy and industrial performance in Section II and then use these relationships in Section III to show the constraints imposed on industry over the next five years by the anticipated stagnation in the production of primary energy. Section IV presents growth paths based on alternative assumptions about Chinese policy decisions and the availability of energy. Finally, in Section V, we sketch briefly our expectations for industrial growth during the rest of the decade, with a brief glance at the 1990s.

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[1] Hua Guofeng, "Report on the Work of the Government," Peking Review, No. 10, 1978, pp. 18–19.

[2] Robert Michael Field, Kathleen M. McGlynn, and William B. Abnett, "Political Conflict and Industrial Growth in China: 1965–1977," in Congress of the United States, Joint Economic Committee, Chinese Economy Post-Mao, Washington, D.C., 1978, pp. 239–283.

II. PERFORMANCE IN 1977–80

A. THE GROSS VALUE OF INDUSTRIAL OUTPUT

Data on the gross value of industrial output (GVIO) are presented in Table 1. These data, which include the output of factories, mines and public utilities, are collected by the "factory reporting method." Each independent accounting unit calculates and reports the gross value of its output, net of intraenterprise transfers, in official constant prices. The GVIO for the country as a whole is the sum of all the reported output values. We have adjusted the official figures to include the output of brigade industry, which the Chinese classify as an agricultural sideline activity. When the value of its output was smaller, its classification was not a matter of great practical significance. As the value of commune industry is already included in GVIO and the value of brigade industry now amounts to 10 percent of light industrial output, however, its exclusion from GVIO would distort the structure of industrial output.

TABLE 1.—CHINA: GROSS VALUE OF INDUSTRIAL OUTPUT, 1977–80

[Billion 1970 yuan]

	1977	1978	1979	1980
Total, including brigade industry	387.9	440.6	479.4	(523.2)
Heavy industry	209.8	242.5	261.1	264.8
Energy	47.1	51.1	54.4	(56.2)
Electric power	14.1	16.1	17.7	(19.0)
Coal	10.3	11.7	11.8	(11.5)
Crude petroleum	8.4	9.5	9.8	(9.8)
Light oil products	(12.9)	(12.4)	(13.7)	(14.4)
Heavy oil products	(1.4)	(1.4)	(1.5)	(1.5)
Metallurgy	29.1	36.9	41.0	(44.1)
Other heavy industry	133.6	154.5	165.6	(164.5)
Light industry	178.1	198.1	218.3	(258.4)
Of which: Brigade industry	15.1	17.5	20.3	(24.0)

Note: Crude petroleum includes the value of natural gas output; figures in parentheses are estimated.

Sources: United Nations Statistical Office, State Statistical Bureau, "Communique on Fulfillment of China's 1980 National Economic Plan," issued Apr. 29, 1981, "Beijing Review," No. 19, 1981, p. 23.

The official GVIO was criticized by Chinese statisticians in the 1950s and has come under attack again in the last year or two because the large and unevenly distributed amount of double counting makes it unacceptable for many types of economic analysis.[3] The recent closing or merger of many small, inefficient enterprises has undoubtedly had some impact on the structure and growth of the official data. The distortion introduced in a period as short as four years (1977–1980) is probably not great and the projections in Section III are made on the assumption that the subordination of industrial enterprises will remain unchanged.

The growth of GVIO declined from 13.6 percent[4] in 1978 to 8.8

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[3] For a description of the factory reporting method in the 1950s and an analysis of its defects, see Robert Michael Field, Nicholas R. Lardy and John Philip Emerson, "A Reconstruction of the Gross Value of Industrial Output by Province in the People's Republic of China: 1949–73." Foreign Economic Report No. 7, U.S. Department of Commerce, Washington, D.C., 1975, pp. 2–8.

[4] Because the data for total GVIO and for light industry used in this paper include brigade industry, rates of growth differ slightly from those reported officially.

percent in 1979 and 9.1 percent in 1980. The rates for 1979 and 1980 are not much below the 10 percent called for in the ten-year plan, but the overall growth conceals profound changes in the relative rates of growth in heavy and light industry. The growth of heavy industry declined from 15.6 percent in 1978 to 7.7 percent in 1979 and only 1.4 percent in 1980, whereas the growth of light industry increased from 11.2 percent in 1978 and 10.2 percent in 1979 to an unprecedented 18.4 percent in 1980. These changes show the combined impact of the complex set of forces that are working to change the structure of Chinese industry. In the first place, after 15 years of extremely rapid growth, the output of energy—particularly petroleum—began to decelerate rapidly. This, in turn, put pressure on the rest of heavy industry.

As the full extent of their problems became clearer, the Chinese shifted priority from heavy to light industry. The response was quick and unambiguous. The surge in light industry in 1980 was primarily the result of relaxing controls over collective industry. Collective enterprises were allowed greater freedom in planning, production and marketing, and benefitted from a stepped-up flow of raw materials. Output from collective industry in the first half of 1980, for example, grew 23.6 percent over the first half of 1979, whereas the output of state-operated industry was up only 11.3 percent. The difference in the rates of growth means that collective industry, which produced less than one-fifth of industrial output in 1979, contributed nearly one-third of the increase in 1980.

B. THE AVAILABILITY OF ENERGY

Data on energy availability are presented in Table 2. The production of primary energy rose 11.2 percent in 1978, 2.8 percent in 1979, and declined in 1980. In 1978, increases of 11 percent in crude petroleum and 12 percent in coal supported a 36-percent increase in exports and a 10-percent increase in the domestic energy supply. The small gains in 1979 and the declines in 1980, however, forced China to rein in the growth of energy exports. The energy available for domestic use rose by a moderate 2 percent in 1979 and then slid in 1980.

The major factor affecting the availability of energy during the second half of the 1970s was the slowing and then the dramatic halt in the growth of crude oil output. Production peaked at the equivalent of 148.6 million tons of coal in 1979.[5] Daqing, the backbone of the oil industry, reached a peak of about 70 million tons of coal equivalent in 1975, a level it has continued to maintain. The fast-growing Renqiu oilfield contributed more than half of the oil output gain in 1978, with new areas at Shengli providing most of the rest. After 1978, the prospects for Renqiu began to dim, and both Renqiu and Shengli apparently reached production peaks. With few additional reserves prepared for development onshore and the prospects for major offshore development still distant, production leveled off.

Beijing adjusted the consumption of crude oil domestically, particularly in 1979 and 1980, to preserve the domestic supply of critical

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[5] All energy figures in this paper are given as their coal equivalents. For the conversion factors used, see Appendix A.

TABLE 2.—CHINA: AVAILABILITY OF ENERGY, 1977-80

[Million tons of coal equivalent]

		1977	1978	1979	1980
A	Primary energy:				
A1	Total:				
A1.1	Production	529.8	589.0	605.3	598.0
A1.2	Losses	39.4	43.7	45.0	44.5
A1.3	Net trade	14.7	20.0	23.7	24.8
A1.4	Available	475.7	525.3	536.6	528.7
A2	Hydroelectricity:				
A2.1	Production	21.4	19.9	21.3	23.5
A3	Natural gas:				
A3.1	Production	16.0	18.2	19.2	18.9
A3.2	Losses	.3	.4	.4	.4
A3.3	Available	15.7	17.8	18.8	18.5
A4	Crude petroleum:				
A4.1	Production	131.0	145.7	148.6	148.3
A4.2	Losses	5.2	5.8	5.9	5.9
A4.3	Net trade	12.7	15.8	17.8	17.8
A4.4	Refined	103.7	110.1	115.0	117.5
A4.5	Available	9.4	14.0	9.8	7.0
A5	Oil products:				
A5.1	Crude oil refined	103.7	110.1	115.0	117.5
A5.2	Losses	8.3	8.8	9.2	9.4
A5.3	Net trade	1.3	2.4	3.1	3.1
A5.4	Light products available	48.5	51.7	54.2	55.9
A5.5	Heavy products available	45.6	47.2	48.4	49.0
A6	Coal:				
A6.1	Production	361.4	405.2	416.2	407.3
A6.2	Losses	25.6	28.7	29.5	28.8
A6.3	Net trade	.7	1.8	2.7	3.8
A6.4	Available	335.1	374.7	384.1	374.7
B	Secondary energy:				
B1	Primary energy consumed	99.0	111.3	118.7	126.1
B1.1	Hydroelectricity	21.4	19.9	21.3	23.5
B1.2	Crude petroleum	9.4	14.0	9.8	7.0
B1.3	Heavy oil products	13.6	14.0	13.2	15.9
B1.4	Coal	54.6	63.4	74.4	79.7
B2	Losses	4.4	5.0	5.3	5.7
B3	Electric energy	23.5	27.1	29.9	31.8
B4	Heat residual	71.0	79.2	83.4	88.7

Note: Losses include internal consumption.

Source: Appendix A.

light oil products while maintaining the level of exports. Between 1978 and 1980, China halved the amount of crude oil being burned as fuel, which allowed refinery feedstocks to grow despite stagnating crude oil output. In addition, expanded secondary refining capacity increased the share of light oil products in refinery output. As a result, output of both heavy and light oil products continued to grow through 1980.

The change in the prospects for the petroleum industry came too abruptly to allow time for an expansion of coal output large enough to maintain growth in energy availability. The coal industry, for years overshadowed by the increasingly important petroleum sector, had neither the capacity nor the infrastructure to maintain its historical growth rate, much less make up for the loss of oil. The commissioning of major new mines was largely ignored for 15 years. Instead, China pushed production at existing modern mines, most of which were probably producing close to capacity as early as 1975. The large production increase in 1978 resulted partly from the expansion of small-scale rural mines and partly from continued recovery from the depressed production levels of 1976. The increase in 1979 was small, and output fell in 1980. Although probably essential for rebuilding stocks, the peak level of production, reached in 1979, pushed the capacity of the modern mines to the limit; coal production bumped up against other constraints, such as rail and port capacity.

The availability of electricity continued to grow throughout the period, although at a sharply declining rate. China reversed the fuel consumption trends of the first half of the 1970s, which had emphasized the conversion of thermal powerplants from coal to oil and the construction of many solely oil-fired powerplants. Except for 1978, when extra production from thermal powerplants was required to make up for the fall in hydroelectric output caused by the drought in Central China, direct consumption of crude has been declining.

C. THE CONSUMPTION OF ENERGY

Data on consumption of energy by major economic sector are presented in Table 3. The heavy industrial sectors dominate both primary and secondary energy consumption, particularly the consumption of heavy oil products, coal and electric power. This structure of consumption resembles the structure found in Japan and Western Europe more closely than that of developing countries with per capita incomes close to China's. The pattern is the cumulative result of the high priority assigned to and the concentration of investment in energy-intensive heavy industry over the last 30 years. Coal remains the major source of fuel for industry and the residential-commercial sector,[6] but the increasing availability of heavy oil during the 1970s led to a greater use of oil in industry for heating and burning. As in other countries, the use of light oil products—particularly diesel fuel and gasoline—is concentrated in the agricultural and transport sectors.

The energy/GVIO elasticity,[7] which had been about 1.66 from 1965 to 1978, dropped to a strikingly low 0.04 from 1978 to 1980. This change reflects the major policy reversals that have taken place since 1978. The steady increase in the consumption of energy by heavy industry was halted in 1979 and reversed in 1980. This, coupled with the rapid growth of light industry, which consumes much less energy per unit of output, means that it was possible to maintain steady growth in GVIO despite the sharp decline in energy growth rates.

Energy conservation has become a major concern. In the past, with abundant and rapidly growing energy supplies, notoriously inefficient energy consumers in heavy industry—notably small fertilizer, steel and cement plants—were allowed to flourish. Faced with increasingly tight energy supplies, Beijing began to reassess the value of inefficient energy consumers, both large and small. To stretch the available energy supply, fuel was rationed for the largest consumers, immediate improvements in unit fuel consumption were made where possible, and some of the most inefficient plants were closed.

Rough measures of output per unit of energy are shown in Table 4. The data show clearly how the much greater value of output per ton of energy consumed in light industry has enabled the Chinese to accelerate the growth of light industry and maintain the growth of industry as a whole despite the increasingly severe energy shortages. They also show the sharp increases in the value of output generated by each ton of energy consumed in metallurgy and other heavy industry. These increases represent the joint effects of energy conserva-

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[6] Firewood, plantstalks, and other noncommercial fuels, which are the major sources of energy in rural areas, are not included in the data presented in this paper.

[7] The energy/GVIO elasticity indicates the percentage change in energy consumed associated with a one percent change in GVIO.

TABLE 3.—CHINA: CONSUMPTION OF ENERGY, 1977–80

[Million tons coal equivalent]

		1977	1978	1979	1980
A	Metallurgy:				
A1	Primary energy consumed	71.6	95.4	93.9	91.7
A1.1	Natural gas	2.4	2.7	2.9	2.8
A1.2	Heavy oil products	11.7	15.7	15.9	15.9
A1.3	Coal	57.5	77.0	75.1	73.0
A2	Electric energy	4.4	5.3	5.7	6.1
A3	Total energy consumed	76.0	100.7	99.6	97.8
B	Other heavy industry:				
B1	Primary energy consumed	130.8	135.1	133.6	115.2
B1.1	Natural gas	5.3	6.0	6.3	6.2
B1.2	Light oil products	9.7	8.2	6.1	6.1
B1.3	Heavy oil products	20.3	17.5	19.3	17.2
B1.4	Coal	95.5	103.4	101.8	85.6
B2	Electric energy	10.9	12.5	13.9	13.9
B3	Total energy consumed	141.7	147.6	147.5	129.0
C	Light Industry:				
C1	Primary energy consumed	33.6	37.4	41.2	48.8
C1.1	Light oil products	5.8	6.5	7.1	8.4
C1.2	Coal	27.8	30.9	34.1	40.3
C2	Electric energy	3.9	4.4	4.8	5.7
C3	Total energy consumed	37.6	41.8	46.0	54.5
D	Agriculture:				
D1	Primary energy consumed	18.0	20.0	22.0	22.2
D1.1	Light oil products	18.0	20.0	22.0	22.2
D2	Electric energy	2.7	3.2	3.6	4.1
D3	Total energy consumed	20.7	23.2	25.6	26.3
E	Transport:				
E1	Primary energy consumed	28.2	31.4	33.2	30.7
E1.1	Light oil products	13.0	15.0	17.0	17.1
E1.2	Coal	15.2	16.4	16.2	13.6
E2	Electric energy	.1	.2	.2	.2
E3	Total energy consumed	28.3	31.6	33.4	30.9
F	Residential-commercial:				
F1	Primary energy consumed	94.5	94.7	94.1	94.0
F1.1	Natural gas	8.0	9.1	9.6	9.5
F1.2	Light oil products	2.0	2.0	2.0	2.0
F1.3	Coal	84.5	83.6	82.5	82.5
F2	Electric energy	1.5	1.6	1.7	1.8
F3	Total energy consumed	96.1	96.3	95.8	95.7

Source: Appendix B.

tion, closure of inefficient plants and changes in the composition of heavy industrial output.

Because of the way we have estimated energy consumption, the data in Table 4 are affected by changes in energy stocks, which are not treated separately in this paper because of inadequate data. Scattered evidence indicates that China was rebuilding coal stocks in 1979, which implies that the increases in gross value of output per unit of energy shown in Table 4 are understated. In 1980, however, it is likely that

TABLE 4.—CHINA: GROSS VALUE OF OUTPUT PER TON OF COAL EQUIVALENT CONSUMED, 1977–80

	1977	1978	1979	1980
Metallurgy:				
Gross value (billion 1970 yuan)	29.1	36.9	41.0	44.1
Energy consumed (million TCE)	76.0	100.7	99.6	97.8
Yuan per TCE	382.9	366.4	411.6	450.9
Other heavy industry:				
Gross value (billion 1970 yuan)	133.6	154.5	165.6	164.5
Energy consumed (million TCE)	141.7	147.6	147.5	129.0
Yuan per TCE	942.5	1,046.7	1,122.7	1,275.2
Light industry:				
Gross value (billion 1970 yuan)	178.1	198.1	218.3	258.4
Energy consumed (million TCE)	37.6	41.8	46.0	54.5
Yuan per TCE	4,736.7	4,739.2	4,745.7	4,741.3

Note: TCE stands for tons of coal equivalent.

Source: Tables 1 and 3.

stocks were drawn down, which implies that the figures for 1980 are overstated. Nevertheless the general trend is clear: major shifts in the industrial structure, the elimination of inefficient consumers and attention to immediate energy saving opportunities resulted in significant gains in the productivity of energy during 1979 and 1980.

The unit values of energy products, which will be used in Section III to estimate the gross value of energy output for the years 1981–1985, are shown in Table 5.

TABLE 5.—CHINA: UNIT VALUE OF ENERGY PRODUCTS, 1977–80

	1977	1978	1979	1980
Electric power:				
Gross value (billion 1970 yuan)	14.1	16.1	17.7	19.0
Electricity sold (million TCE)	23.5	27.1	29.9	31.8
Yuan per TCE	600.0	594.1	592.0	597.5
Coal:				
Gross value (billion 1970 yuan)	10.3	11.7	11.8	11.5
Coal sold (million TCE)	335.8	376.5	386.8	378.5
Net trade	0.7	1.8	2.7	3.8
Distributed domestically	335.1	374.7	384.1	374.7
Yuan per TCE	30.7	31.1	30.5	30.4
Crude petroleum:				
Gross value (billion 1970 yuan)	8.4	9.5	9.8	9.8
Crude petroleum sold (million TCE)	141.5	157.7	161.5	160.9
Net trade	12.7	15.8	17.8	17.8
Sold to refineries	103.8	110.1	115.0	117.5
Distributed domestically	25.1	31.8	28.5	25.5
Yuan per TCE	59.4	60.2	60.7	60.9
Oil products:				
Gross value (billion 1970 yuan):				
Light oil products	12.9	12.4	13.7	14.4
Heavy oil products	1.4	1.4	1.5	1.5
Oil products sold (million TCE):				
Light oil products	49.8	54.1	57.3	59.0
Net trade	1.3	2.4	3.1	3.1
Distributed domestically	48.5	51.7	54.2	55.9
Heavy oil products	45.6	47.2	48.4	49.0
Yuan per TCE:				
Light oil products	259.0	229.2	239.1	244.1
Heavy oil products	30.7	29.7	31.0	30.6

Note: Crude petroleum includes natural gas; TCE stands for tons of coal equivalent

Source: Tables 1 and 2

III. PROSPECTS FOR 1981–85

A. THE AVAILABILITY OF ENERGY

A baseline projection of energy availability through 1985 is presented in Table 6. We expect across-the-board declines in fossil fuel output in 1981 to be followed by a recovery in the coal industry rapid enough to offset the continued decline in liquid fuels output in 1982–1985. The projection thus shows overall energy output dipping slightly in 1981 and then recovering slowly to a point just short of the 1979 peak. The baseline projection assumes that (a) net trade in energy will remain at the 1980 level, (b) a million tons of secondary refining capacity will be added each year, and (c) a vigorous campaign will eliminate the burning of crude oil by 1985. The reduction in the amount of crude oil burned and the increase in secondary cracking capacity will gradually increase the supply of light oil products—and decrease the supply of heavy oil products—despite the decline in crude oil output.

For the smaller sources of primary energy, the trend in natural gas production is expected to follow that of crude oil, and hydropower output is expected to rise at about 6 percent per year if the large-scale hydroelectric projects currently under construction are completed on schedule and the small-scale hydropower program continues.

TABLE 6.—CHINA: AVAILABILITY OF ENERGY 1980–85

[Million tons of coal equivalent]

	1980	1981	1982	1983	1984	1985
Primary energy:						
Total:						
Production	598.0	582.1	587.9	593.5	597.5	603.0
Losses	44.5	43.1	43.4	43.6	43.7	44.0
Net trade	24.8	24.8	24.8	24.8	24.8	24.8
Available	528.7	514.2	519.7	525.0	529.0	534.3
Hydroelectricity: Production	23.5	24.2	25.5	27.7	29.9	32.1
Natural gas:						
Production	18.9	17.8	17.3	16.9	16.4	16.0
Losses	.4	.4	.3	.3	.3	.3
Available	18.5	17.5	17.0	16.6	16.1	15.7
Crude petroleum:						
Production	148.3	140.0	135.8	133.0	128.8	126.0
Losses	6.9	5.6	5.4	5.3	5.2	5.0
Net trade	17.8	17.8	17.8	17.8	17.8	17.8
Refined	117.5	110.9	108.3	107.0	104.4	103.1
Available	7.0	5.6	4.2	2.8	1.4	0
Oil products:						
Crude oil refined	117.5	110.9	108.3	107.0	104.4	103.1
Losses	9.4	8.9	8.7	8.6	8.4	8.2
Net trade	3.1	3.1	3.1	3.1	3.1	3.1
Light products available	55.9	55.2	55.6	56.5	56.9	57.7
Heavy products available	49.0	43.7	40.9	38.8	36.0	34.0
Coal:						
Production	407.3	400.1	409.3	415.8	422.4	428.9
Losses	28.8	28.3	29.0	29.4	29.9	30.4
Net trade	3.8	3.8	3.8	3.8	3.8	3.8
Available	374.7	368.0	376.5	382.6	388.7	394.8
Secondary energy:						
Primary energy consumed	126.1	124.8	128.3	131.7	134.9	138.4
Hydroelectricity	23.5	24.2	25.5	27.7	29.9	32.1
Crude petroleum	7.0	5.6	4.2	2.8	1.4	0
Heavy oil products	15.9	14.7	13.5	12.4	11.2	10.0
Coal	79.7	80.3	85.0	88.8	92.4	96.4
Losses	5.7	5.6	5.7	5.9	6.0	6.1
Electric energy	31.8	31.6	32.5	33.3	34.2	35.1
Heat residual	88.7	87.6	90.1	92.5	94.7	97.2

Note: Losses include internal consumption.

1. Oil

The steady decline foreseen for oil output to about 126 million tons of coal equivalent in 1985 is based on a preliminary analysis of China's major oilfields. For Daqing, Shengli and Renqiu (the three largest producing oilfields), the baseline assumes that maximum annual production has already been attained.

Daqing, which has produced about 70 million tons annually since 1975, is likely to decline soon, perhaps this year. The Chinese have said that more than 20 percent of Daqing's reserves had been produced by the end of 1980 and that 45 percent would be recovered ultimately. Based on the field's production history and the 45 percent recovery factor, we expect output at Daqing to decline 30 percent by 1985.

Little is known about the reserves or ultimate recovery rates at Shengli or Renqiu. We assume that output at Shengli will decline at the same rate as Daqing through 1985. For Renqiu, a relatively new oilfield, we assume that output will be maintained at about 22 million tons through 1985.

For China's other oilfields, we assume a net increase in production of about 4 million tons by 1985, with gains onshore (mainly at Liaohe) and offshore (mainly in the Bohai) more than offsetting declines at smaller onshore fields.

The baseline for crude oil output is, if anything, optimistic. Production at all three of the major fields could easily fall below our current estimates. The ultimate recovery rate that the Chinese expect at Daqing is very high, and actual recovery could be as low at 35 to 40 percent of reserves. In which case, output at Daqing could fall 5 to 10 million tons below our current output estimate for 1985. Exploitation of Shengli has presented the Chinese with severe technical problems for years, making a much more rapid output decline probable. The prospects for Renqiu are the most uncertain. The bulk of the information on Renqiu concerns only one of its several producing areas. Based on this tiny sample, however, the prospects for production at Renqiu are not encouraging. Renqiu's potential is unknown, but a small decline in output through 1985 seems more likely than an upward surge.

The decision whether or not to continue crude oil exports will be based largely on balance of payments considerations. Because crude oil and product exports now account for about 20 percent of export earnings, Beijing probably needs to maintain at least the current level of revenues from oil exports. The baseline assumes that oil and product exports will be maintained at the 1980 level. If the current softening of the world oil market is temporary and oil prices resume their upward trend, China might decide to let the volume of oil exports slide, trading a potential foreign exchange windfall for a greater availability of oil for domestic use. No increase in crude oil exports is likely.[8]

China has made it clear that it will attempt to eliminate the burning of crude oil by 1985. Our baseline projection assumes that this will be met; it also assumes that China will improve the light oil yield of its refineries by adding 1 million tons of catalytic cracking capacity each year through 1985. These policies, taken together, will allow the output of light oil products to rise despite maintenance of exports and a dropoff in crude oil production.

2. Coal

The pattern of coal production, falling in 1981 and then rising slowly from 1982 to 1985, is based on the coal output target for 1981 and statements about planned additions to capacity. The 1981 plan calls for output of 600 million tons. Our baseline estimate, however, is 610 million tons, which is 10 million tons above plan but still below the 1979 level. Our estimate is higher than the planned output, first, because China announced very conservative coal production targets in both 1979 and 1980, and second, because considerable pressure exists for increased production to relieve the energy shortages caused by the decline in oil output.

Beyond 1981, our estimates assume that the coal industry (a) increases capacity at the rate planned for new mines; (b) expands capacity at existing mines, but at a rate below that of the last two years; and (c) raises productivity fast enough to balance depletion. Output from small rural mines is not expected to increase, since their production appears to have been excessive in the last few years. Gao Yangwen, the Coal Minister, has said that more than 75 million tons of coal capacity is under construction, to be brought into production at the rate of 10 million tons per year. We assume that this will occur. Additions to capacity from expanding or rebuilding existing mines, which have been running at 4 to 5 million tons per year in recent years, are expected to continue, although at a reduced rate. Some depletion—both economic and technical—is occurring, particularly at the older mines in the Northeast. Data on rates of depletion are not avaliable. We assume that any closings will be balanced by productivity increases at other mines from mechanization and reform. Overall, we expect coal production to increase by 10 to 14 million tons per year through 1985.

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[8] We do not know how the offshore oil produced by Western oil companies under sharing agreements will be treated, but have not considered them as exports here. In any case, the volume of oil that will be produced through 1985 under sharing agreements will be small.

Our projection of coal output has a large margin of error. First, investment in the coal industry—which will require both domestic and foreign equipment—cannot be forecast accurately until the scope of China's current program to cut back domestic investment and limit imports is known. And second, the rural component, which accounts for nearly half of output, is subject to rapid expansion and contraction. This "buffer" function of the small mines leads us to believe that our baseline projection for coal output is close to the lower limit of the range of production possibilities.

The upper limit is probably not much above the baseline. China originally had some 120 million tons of new capacity under construction. Cutting the program back to the 75 million tons announced by the coal minister undoubtedly reflects capital limitations, which are also a constraint to growth. If oil production deteriorates more rapidly than expected, China could restore the 45 million tons to the construction program and might be able to put at least part of it into operation by 1985. Peijing might also press some uneconomic deposits back into service and expand small-mine output again. If an all-out effort were made, however, the already overcrowded transport system might emerge as the limiting factor.

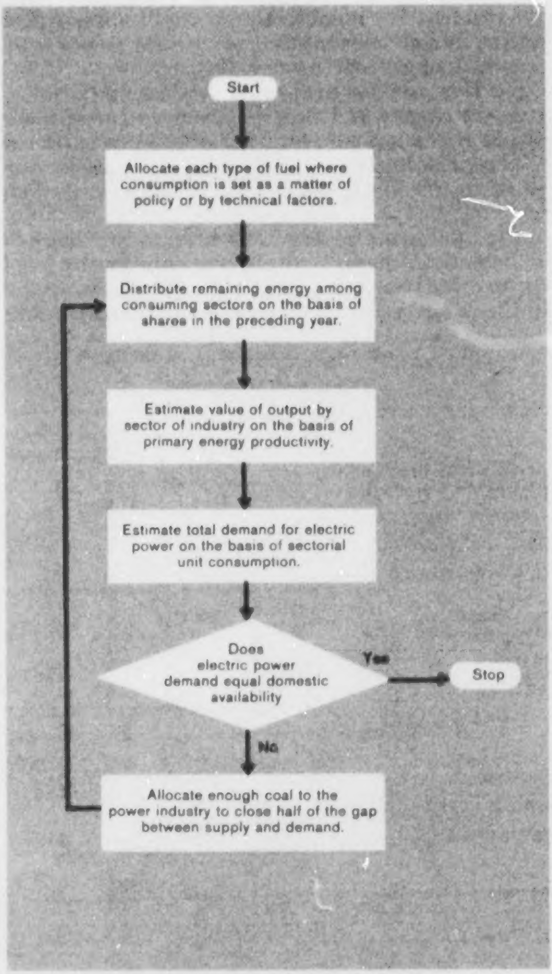
B. THE CONSUMPTION OF ENERGY

Consumption of energy is projected through 1985 by means of a model that distributes fuel to the various sectors of the economy subject to certain technical and policy constraints. The general structure of the model is shown in Figure 1. In broad terms, each type of primary energy is allocated among competing users on the basis of their consumption in the preceding year. Where, in our judgment, consumption is determined as a matter of policy or by institutional or technical factors, we override the estimate based on shares. The model then estimates the gross value of output produced by each sector of industry from the productivity of the primary energy consumed. Finally, the demand for electric power is calculated and compared with the estimate of supply based on the allocation of fuel. If demand does not equal supply, the allocation of fuel is adjusted and the model iterates until a balance is achieved.

The five major assumptions we made about Chinese industrial and energy policy are: (a) the growth of light industrial output will be maintained at 8 percent throughout the period. (b) dual-fired power-

Figure 1

A Flow Chart of the Model


Start
Allocate each type of fuel where consumption is set as a matter of policy or by technical factors.
Distribute remaining energy among consuming sectors on the basis of shares in the preceding year.
Estimate value of output by sector of industry on the basis of primary energy productivity.
Estimate total demand for electric power on the basis of sectorial unit consumption.
Does electric power demand equal domestic availability
Yes
Stop
No
Allocate enough coal to the power industry to close half of the gap between supply and demand.

plants will be switched back to coal and the burning of crude oil eliminated entirely by 1985; (c) the reduction of steel output in 1981 will cut consumption of coal in the metallurgical sector by 10 percent, (d) the use of heavy oil for heating and burning in the metallurgical industry will be reduced 20 percent by 1985, and (e) the consumption of coal in the residential-commercial sector will not be allowed to grow and the non-industrial consumption of electric power will be held to their historic rates of growth through 1985.

Finally, for the baseline projection, we assumed that the productivity of primary energy and electric power will remain constant during the period. Although conservation of fuel remains an important policy in China, Beijing has already tackled its easier energy-saving opportunities; future conservation will be progressively more difficult and costly.

The projected pattern of energy consumption through 1985 is summarized in Table 7. A major drop in consumption by heavy industry is occurring in 1981 because of the decline in the availability of coal and oil and the priority for energy accorded to light industry.

TABLE 7.—CHINA: CONSUMPTION OF ENERGY, 1980–85

[Million tons of coal equivalent]

	1980	1981	1982	1983	1984	1985
Metallurgy:						
Primary energy consumed	91.7	83.4	82.9	81.7	80.5	79.1
Natural gas	2.8	2.7	2.6	2.5	2.4	2.4
Heavy oil products	15.9	15.0	14.5	14.0	13.5	13.0
Coal	73.0	65.7	65.8	65.2	64.6	63.7
Electric energy	6.1	5.6	5.5	5.5	5.4	5.3
Total energy consumed	97.8	88.9	88.4	87.2	85.9	84.3
Other heavy industry:						
Primary energy consumed	115.2	108.6	107.4	106.1	104.0	102.4
Natural gas	6.2	5.9	5.7	5.6	5.4	5.3
Light oil products	6.1	6.0	5.9	5.9	5.9	5.9
Heavy oil products	17.2	14.0	12.8	12.4	11.3	11.0
Coal	85.6	82.8	82.9	82.2	81.4	80.2
Electric energy	13.9	13.3	13.3	13.3	13.2	13.2
Total energy consumed	129.0	121.9	120.7	119.5	117.2	115.6
Light industry:						
Primary energy consumed	48.8	52.7	56.9	61.5	66.4	71.7
Light oil products	8.4	9.1	9.9	10.6	11.5	12.4
Coal	40.3	43.6	47.0	50.8	54.9	59.3
Electric energy	5.7	6.2	6.7	7.2	7.8	8.4
Total energy consumed	54.5	58.9	63.6	68.7	74.2	80.1
Agriculture:						
Primary energy consumed	22.2	21.5	21.4	21.4	21.2	21.2
Light oil products	22.2	21.5	21.4	21.4	21.2	21.2
Electric energy	4.1	4.4	4.8	5.1	5.4	5.7
Total energy consumed	26.3	26.0	26.1	26.5	26.6	26.9
Transport:						
Primary energy consumed	30.7	29.8	29.7	29.6	29.3	29.1
Light oil products	17.1	16.7	16.5	16.6	16.4	16.3
Coal	13.6	13.1	13.2	13.0	12.9	12.7
Electric energy	.2	.2	.2	.3	.3	.3
Total energy consumed	30.9	30.0	30.0	29.9	29.6	29.4
Residential-commercial:						
Primary energy consumed	94.0	93.4	93.1	92.9	92.6	92.4
Natural gas	9.5	8.9	8.7	8.5	8.2	8.0
Light oil products	2.0	2.0	1.9	1.9	1.9	1.9
Coal	82.5	82.5	82.5	82.5	82.5	82.5
Electric energy	1.8	1.8	1.9	2.0	2.0	2.1
Total energy consumed	95.7	95.2	95.0	94.9	94.7	94.6

In metallurgy, the drop in the consumption of each type of fuel in 1981 is caused by China's determined effort to cut back steel production in order to choke off the supply of raw materials for capital construction. After two years of overfulfilling targets and evading pressures to cut back output, the ferrous metals industry is finally knuckling under to Beijing. As the readjustment of industry progresses, however, the demand for new types of metallurgical products will prevent energy consumption from falling much further.

In other heavy industry, projected consumption of each fuel falls throughout the period, with heavy oil consumption falling the most. Even though Beijing is moving vigorously to convert boilers and furnaces from oil to coal, fuel for heavy industrial boilers will still be in short supply in 1985. In the area of light oil products, the concerted effort to expand output will allow the continued expansion of the tiny petrochemical industry and the maintenance of 1980 consumption levels by heavy industry as a whole, even with the rapidly rising demand elsewhere in the economy.

In light industry, fuel consumption will be controlled by the 8-percent rate of growth planned by the government.

In the non-industrial sectors, projected fuel consumption declines, but the effects of the declines differ. In agriculture, the decline in light oil consumption reflects China's decision to slow substantially the agricultural mechanization program. Because of the relative scarcity of light fuels, agricultural equipment will have to be used much more efficiently. Increased rural consumption of electric power will offset some of the slight decline in primary energy consumption. This will be particularly true for irrigation and drainage equipment, where electric motors have increasingly displaced internal combustion engines in the total inventory.

In the transport sector, projected consumption of all fuels falls throughout the period. Although the coal supply to rail transport appears tight, particularly in view of the continuing importance of steam locomotives, consumption is so small relative to other users that minor shifts of coal from other uses could easily allow rail transport to expand. On the other hand, the drop in oil consumption signals that some form of policy intervention will probably be required during the period. In view of the expansion of light industry, highway transport (the major consumer of light oil products) will need to expand. China, taking strict measures to reduce excessive fuel consumption by highway vehicles, will start to switch from gas-guzzling Liberation trucks to larger, more efficient diesels. In addition, large numbers of trucks have been mothballed over the last two years. Beijing intends to force the provinces to reduce the number of inefficient units on the road, to consolidate redundant or under-capacity runs, and to reduce the use of the vehicles for non-productive and private uses. Despite these measures, chronic shortages of fuels for highway transport will persist.

In the residential-commercial sector, projected overall energy consumption changes very little. We expect the use of electric power to rise, partly displacing the direct consumption of primary energy such as kerosene for home lighting. However, plans to convert urban residential heating from direct coal burning to natural gas may have to wait until the late 1980s or until natural gas supplies recover. Coal for residential use, however, might be converted into lower BTU gas and by-product coke, which together would provide a more energy-efficient use of coal for residential heating.

The production and consumption of electric power is projected through 1985 in Table 8. As described above, the model iterates until the electricity that can be generated from the primary energy allocated to the power industry equals the amount demanded by the levels of activity in the various consuming sectors.

Coal consumption rises to support the overall 4-percent rise in thermal power production, but more importantly, to substitute for more than half of the oil used in thermal generation in 1980. This increased coal requirement by the electric power industry is a major reason for the continued decline in coal consumption by heavy industry over the period despite the anticipated recovery in coal availability after 1981. We have assumed that there will be no improvement in the efficiency with which fuel is consumed by thermal powerplants over this period. Further gains would entail the replacement of older, inefficient thermal plants by larger more efficient units. With demand for power growing slowly, and with the limited capital construction funds targeted primarily for China's hydroelectric program and improvements in the transmission system, we anticipate a slowdown in thermal plant construction.

TABLE 8.—CHINA: PRODUCTION AND CONSUMPTION OF ELECTRIC POWER, 1980–85

[Million tons of coal equivalent]

	1980	1981	1982	1983	1984	1985
Production:						
Primary energy consumed	126.1	124.8	128.3	131.7	134.9	138.4
Hydroelectricity	23.5	24.2	25.5	27.7	29.9	32.1
Crude petroleum	7.0	5.6	4.2	2.8	1.4	0
Heavy oil products	15.9	14.7	13.5	12.4	11.2	10.0
Coal	79.7	80.3	85.0	88.8	92.4	96.4
Losses	5.7	5.6	5.7	5.9	6.0	6.1
Electric energy	31.8	31.6	32.5	33.3	34.2	35.1
Heat residual	88.7	87.6	90.1	92.5	94.7	97.2
Consumption:						
Metallurgy	6.1	5.6	5.5	5.5	5.4	5.3
Other heavy industry	13.9	13.3	13.3	13.3	13.2	13.2
Light industry	5.7	6.2	6.7	7.2	7.8	8.4
Agriculture	4.1	4.4	4.8	5.1	5.4	5.7
Transport	.2	.2	.3	.3	.3	.3
Residential-commercial	1.8	1.8	1.9	2.0	2.0	2.1
Total	31.8	31.6	32.5	33.3	34.2	35.1

Note: Losses include internal consumotion. The heat residual is the difference between total energy consumed and the energy content of the electric power generated. The size of the heat residual for China shows the low thermal efficiency of PRC power plants relative to other countries.

The small decline in power consumption by heavy industry is not large enough to offset the steady increases in consumption by light industry and the non-industrial sectors. As a result, electric power production is expected to rise by about 10 percent between 1980 and 1985.

C. THE ENERGY BALANCE

Energy balance sheets for 1980 and 1985 are presented in Table 9.[9] They summarize the effects of differential rates of growth in the output of primary fuels and the government's policies toward energy use. The comparative balances show little change in overall energy availability but marked differences in composition, mainly because of changes in the oil component. Crude oil declines from 20 percent of energy available domestically in 1980 to 17 percent in 1985. In particular, the oil available for boiler use drops dramatically because of the decline in oil output, the push toward refining instead of burning crude oil, and the increased capacity to refine light oil products. As a result, light oil products maintain their share of the energy available over the period despite the decline in the amount of crude oil refined.

The consumption pattern of the various sectors will adjust to changes in the availability of the different types of fuel and in economic development policies. Light industry is expected to consume 13 percent of primary energy in 1985, up from 9 percent in 1980. This policy-determined rise, coupled with the increasingly tight supply of oil-based boiler fuels, will cause intense competition among heavy industrial users. Fuel consumption in the electric power industry—driven by the need to substitute coal for oil and the need to meet rising demand from light industry and the non-industrial sectors—will increase and shift strongly toward coal. Heavy industry, also faced with fuel substitution problems, must reduce its overall energy consumption in order to provide the power industry enough fuel. Even though its share in total energy consumption drops from 39 percent to 34 percent, heavy industry remains the single largest primary energy consumer in 1985.

As a result of these pressures, the use of oil becomes more concentrated in those sectors where it is difficult or impossible to substitute fuels in the short run, namely agriculture and transport. On the other hand, coal will be used more broadly through the economy, while within heavy industry its use is more concentrated in the generation of electricity.

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[9] The form of the table is adopted from Robert Campbell, "Soviet Energy Balances," The Rand Corp., R-2257-DOE, December 1978.

TABLE 9.—CHINA: ENERGY BALANCE, 1980 AND 1985

[Million tons of coal equivalent]

Primary sources and energy products	Output	Losses and internal consumption	Net trade	Intrasector transfers — Inflow	Intrasector transfers — Outflow	Available for distribution	Electric power	Metallurgy	Other heavy industry	Light industry	Agriculture	Transport	Residential-commercial
1980:													
Hydropower	23.5					23.5	23.5						
Natural gas	18.9	0.4				18.5		2.8	6.2				9.5
Crude petroleum	148.3	5.9	17.8		117.5	7.0	7.0						
Light oil products		9.4	3.1	117.5	49.0	55.9			6.1	8.4	22.2	17.1	2.0
Heavy oil products				49.0		49.0	15.9	15.9	17.2				
Coal	407.3	28.8	3.8			374.7	79.7	73.0	85.6	40.3		13.6	82.5
Total primary output	598.0	44.5	24.8	166.5	166.5	528.7	126.1	91.7	115.2	48.8	22.2	30.7	94.0
Electric energy		5.7		37.4		31.8		6.1	13.9	5.7	4.1	.2	1.8
Heat residual from power generation		88.7		88.7									
Total primary and secondary						434.3		97.8	129.0	54.5	26.3	30.9	95.7
1985:													
Hydropower	32.1					32.1	32.1						
Natural gas	16.0	.3				15.7		2.4	5.3				8.0
Crude petroleum	126.0	5.0	17.8		103.1								
Light oil products		8.2	3.1	103.1	34.0	57.7			5.9	12.4	21.2	16.3	1.9
Heavy oil products				34.0		34.0	10.0	13.0	11.0				
Coal	428.9	30.4	3.8			394.8	96.4	63.7	80.2	59.3		12.7	82.5
Total primary output	603.0	44.0	24.8	137.1	137.1	534.3	138.4	79.1	102.4	71.7	21.2	29.1	92.4
Electric energy		6.1		41.2		35.1		5.3	13.2	8.4	5.7	.3	2.1
Heat residual from power generation		97.2		97.2									
Total primary and secondary						430.9		84.3	115.6	80.1	26.9	29.4	94.6

Source: Tables 2 and 3.

D. THE GROSS VALUE OF INDUSTRIAL OUTPUT

The gross value of industrial output is projected through 1985 in Table 10, and the shares of the major sectors in 1980 and 1985 are presented in Figure 2. The growth and change in structure are determined by our analysis of the outlook for energy production and our assumptions about the government policies toward energy and industry. In brief, the value of primary energy reflects our production estimates; the value of electric power is set by demand, and the value of light industry by our assumption that the Chinese will maintain the current 8-percent rate of growth in light industry. The value of output in metallurgy and other heavy industry is then determined by the model.

Despite the severe energy constraint over the next five years, the value of industry output rises in our projection 1.2 percent in 1981 and then about 4 percent annually through 1985. The 8-percent growth in light industry more than compensates for the decline in heavy industry, which drops 5.5 percent in 1981 and continues to slip about 1 percent per year through 1985. The 2-percent rise in the value of energy output is the result of moderate increases in the output of electric power, coal, and light oil products that offset declines in the output of crude petroleum and heavy oil products. Metallurgical output drops by 13.8 percent over the period, and the output of other heavy industry by 11.1 percent.

The pattern of output shown in Table 10 and Figure 2 raises two major questions. First, are the relative rates of growth in light and heavy industry compatible? And second, what does the decline in the output of other heavy industry imply?

TABLE 10.—CHINA: GROSS VALUE OF INDUSTRIAL OUTPUT, 1980-85

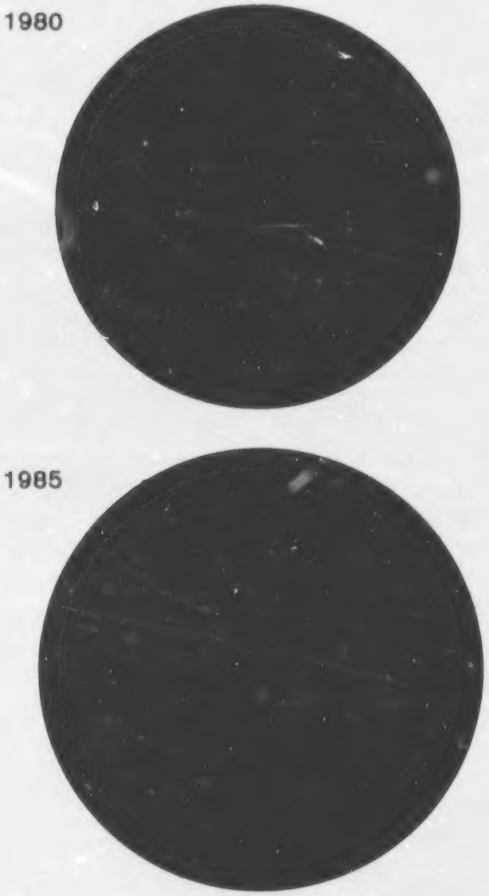
[Billion 1970 yuan]

	1980	1981	1982	1983	1984	1985
Total, including brigade industry	523.2	529.3	550.3	572.7	595.5	621.3
Heavy industry	264.8	250.2	248.9	247.2	243.9	241.6
Energy	56.2	55.1	55.5	56.3	56.6	57.3
Electric power	19.0	18.9	19.4	19.9	20.4	21.0
Coal	11.5	11.4	11.6	11.8	12.0	12.2
Crude petroleum	9.8	9.3	9.0	8.8	8.5	8.3
Light oil products	14.4	14.2	14.3	14.6	14.6	14.8
Heavy oil products	1.5	1.3	1.2	1.2	1.1	1.0
Metallurgy	44.1	40.1	39.9	39.3	38.7	38.0
Other heavy industry	164.5	155.2	153.5	151.6	148.6	146.3
Light industry	258.4	279.1	301.4	325.5	351.6	379.7

Note: Crude petroleum includes the value of natural gas output.

Between 1980 and 1985, light industry's share in industrial output rises from 49.4 percent to 61.1 percent while the share of heavy industry falls from 50.6 percent to 38.9 percent. We believe the Chinese will be able to achieve this unprecedented shift in the industrial structure, because China's light industry resembles that of LDC's, where labor-intensive handicrafts have been able to flourish with little need for a parallel development of heavy industry. In China, half of light industrial output comes from commune and brigade industry and urban collective enterprises which rely on labor and simple tools

Figure 2
China: Gross Value of Industrial Output by Major Sector



rather than on capital inputs from heavy industry. And two-thirds of all light industrial output is based primarily on agricultural—rather than industrial—raw materials. For example, food processing, paper, and textiles (excluding chemical fibers), which together contributed 57 percent of the output value of light industry in 1979, are based almost exclusively on agricultural raw materials. Even China's recent push to expand the production of consumer durables will probably be limited as much by general purchasing power and other demand factors as by the lack of heavy industrial inputs. Finally, the requirements of the chemical light industries—such as pharmaceuticals and synthetic fibers—for inputs from heavy industry are fairly small and can easily be met by a combination of domestic production and imports.

The decline in the output of other heavy industry over the next five years implies that the commodity mix is being rationalized. Physical output data for the first five months of 1981 indicate that the process of adjustment has already started. For example, the output of many commodities that had grown extremely rapidly in the last three or four years and that had built up excessively large stocks—such as crude steel, tractors and freight cars—is now declining steeply. And for other commodities, such as a whole range of chemicals, output is edging downward to avoid stockbuilding. But the decline also implies that the production of machinery and equipment—which made up 75 percent of other heavy industry in 1979—may not be great enough to meet even the lesser demand of China's greatly reduced capital construction program.

IV. ALTERNATIVE PROJECTIONS FOR 1981-85

A. THE AVAILABILITY OF ENERGY

Plausible ranges around the baseline projections for the production of natural gas, crude petroleum, and coal are presented in Table 11. Only the baseline is given for hydroelectricity, as production will depend on capacity that is already under construction and likely to be completed. The estimated ranges are fairly narrow. On the one hand, physical, technical, and economic constraints will prevent production from being much higher than in our baseline projections; on the other hand, the high level of demand will prevent it from falling much below the baseline. Other than increasing or decreasing production, the principal alternatives for adjusting the pattern of energy availability are changing the level of energy trade and the mix of oil products.

Given the significant downside risks for output of onshore oil and the ever-receding timetable for the development of offshore oil, oil output probably will not rise above the planned 1981 level for the next five years. Consequently, the high series is held constant. The low series assumes that the impending output declines at Daqing and in the major North China basin have already started and that recovery factors will be lower than the Chinese estimates, which were accepted in the baseline. In view of bright prospects for coal and offshore oil in the late 1980s, China probably would choose to maintain produc-

TABLE 11.—CHINA: ENERGY PRODUCTION ALTERNATIVES, 1980–85

[Million tons of coal equivalent]

	1980	1981	1982	1983	1984	1985
Total:						
Low	598.0	582.1	584.8	585.6	586.5	587.3
Baseline	598.0	582.1	587.9	593.5	597.5	603.0
High	598.0	582.1	599.2	614.5	629.8	645.1
Hydroelectricity: Baseline	23.5	24.2	25.5	27.7	29.9	32.1
Natural gas:						
Low	18.9	17.8	17.0	16.1	15.2	14.3
Baseline	18.9	17.8	17.3	16.9	16.4	16.0
High	18.9	17.8	17.8	17.8	17.8	17.8
Crude petroleum:						
Low	148.3	140.0	133.0	126.0	119.0	112.0
Baseline	148.3	140.0	135.8	133.0	128.8	126.0
High	148.3	140.0	140.0	140.0	140.0	140.0
Coal:						
Baseline	407.3	400.1	409.3	415.8	422.4	428.9
High	407.3	400.1	415.8	428.9	442.1	455.2

tion at its onshore fields at higher levels for a shorter period of time, even though it would lower the amount of oil that could be recovered over the life of the fields.

Natural gas output—which is produced mainly at oilfields—follows the trend of oil in all three series.

Coal output rises by about 13 million tons per year in the high series. Because of continuing transport constraints in North and East China, where most new coal development is concentrated, the high series would probably require renewed emphasis on the marginal deposits in South China and the lifting of current restrictions on the expansion of small-mine output. We would not expect this type of expansion, however, unless the production of crude petroleum were substantially below our baseline projection. Production of coal is not likely to fall below the baseline series as output in South China and at small mines could easily compensate for any shortfall at the large northern mines.

The effects on the availability and consumption of energy and on the gross values of industrial output of all forms of energy being simultaneously produced at the low or high end of their ranges is shown in Table 12. Even at the low end of the range, industry continues to grow—although at a slow rate. Tight energy supplies and the continuing high priority of light industry, however, force the rate of decline in heavy industry down more than a percentage point below the baseline rate. The non-industrial sectors also suffer additional primary energy losses, mainly in the consumption of light oil products. According to our projections, these losses are not made up by the rise in their allocation of electricity.

Even at the high end of the range, industrial growth is held below 5 percent per year. The more ample energy supply, however, does allow heavy industry to grow during the period. The increase in the high-value energy sector contributes directly to the value of output, as well as allowing some growth in metallurgy and other heavy industry. The non-industrial sectors also increase their primary energy consumption, but by small amounts.

The extreme ranges of energy production shown in Table 11 are not likely to occur simultaneously. Coal output, for example, probably

TABLE 12.—CHINA: THE EFFECT OF ALTERNATIVE ENERGY PRODUCTION ESTIMATES ON INDUSTRIAL PERFORMANCE, 1980–85

[Average annual growth rates in percent]

	Energy production estimates		
	Low	Baseline	High
Availability of primary energy	−0.3	0.2	1.6
Consumption of primary energy:			
Metallurgy	−2.7	−2.9	−1.4
Other heavy industry	−4.0	−2.3	.8
Light industry	8.0	8.0	8.0
Agriculture	−2.4	−1.0	.6
Transport	−1.7	−1.1	.6
Residential-Commerical	−.6	−.3	−.1
Availability of electricity	1.5	2.0	3.2
Gross value of industrial output	3.0	3.5	4.6
Heavy industry	−3.0	−1.8	.7
Light industry	8.0	8.0	8.0

would not be forced to the high end of its range unless the availability of crude petroleum dropped substantially below our baseline projection. In consequence, the variation in rates of growth due to variations in energy availability may be narrower than those in Table 12.

China has only limited options for changing the pattern of energy availability other than by increasing or decreasing production. The level of energy trade, primarily oil, is unlikely to rise substantially over the period because of the shortage of domestic energy availability and probably will not be allowed to fall because of China's foreign exchange requirements.

The split between light and heavy oil products will depend on the rate at which secondary refining capacity is added. For the baseline projection, we have assumed that a million tons of capacity will be put into operation each year. We judge that this is the maximum that China can achieve over the period. Reducing the annual additions to capacity would boost the amount of heavy oil available to metallurgy and other heavy industry, which in turn would increase their rate of growth marginally—but at an unacceptably high cost to the non-industrial sectors.

Large oil imports are unlikely, but China might lessen the impact of a severe shortfall in light oil products by importing crude oil to process in its currently underutilized primary refining capacity. Beijing might even be able to export some of the products to help reduce the foreign exchange cost.

B. THE USE OF ENERGY

The average annual rates of change for energy consumption and the gross value of industrial output that would result from a more rapid increase in the productivity of energy within metallurgy and other heavy industry are presented in Table 13. As expected, performance is improved, but the gains are less than proportional to the change in productivity. Each percentage point improvement in the productivity of energy results in only half a percentage point gain in the growth of the output of heavy industry as a whole because the increased industrial activity raises the demand for electric power. As a result, part of the primary energy saved is channeled to the power industry. Increases in the productivity of energy within heavy industry have little effect on the non-industrial sectors.

TABLE 13.—CHINA: THE EFFECT OF ALTERNATIVE GROWTH RATES OF ENERGY PRODUCTIVITY IN HEAVY INDUSTRY ON INDUSTRIAL PERFORMANCE, 1980–85

[Average annual growth rate in percent]

	Growth of energy productivity in metallurgy and other heavy industry		
	Baseline	1 percent	5 percent
Availability of primary energy	0.2	0.2	0.2
Consumption of primary energy:			
Heavy industry	−2.6	−2.8	−3.2
Light industry	8.0	8.0	8.0
Non-industrial sectors	−.6	−.6	−.6
Availability of electricity	2.0	2.2	2.8
Gross value of industrial output	3.5	3.7	4.4
Heavy industry	−1.8	−1.3	.3
Light industry	8.0	8.0	8.0

We believe that China will have difficulty sustaining even small gains in productivity over the short term. The high unit consumption of energy in metallurgy and other heavy industry has been reduced substantially during the last two or three years, but the reduction has been as much the result of closing small, inefficient plants and shifting the structure within heavy industry as the result of increasing the efficiency with which energy is used in specific applications. In the long run, major ongoing energy savings will require that old, energy-inefficient capital be replaced with equipment that is more efficient because of technology or scale of operation. Progress will be slow because of the current vigorous efforts to raise the standard of living at the expense of investment.

We have not changed the productivity of electric energy in industry or the efficiency of transforming primary energy into electric power. In the past, when primary energy was both relatively abundant and comparatively cheap, it was used inefficiently. In contrast, chronic shortages of electricity have made the power industry more efficient. Further increases in the efficiency with which primary energy is transformed into electric power will require capital improvements at existing powerplants and the construction of large, new thermal powerplants. Major improvements in these areas are not expected in view of China's concentration of the investment funds for the power industry in hydroelectric projects, the transmission system, and fuel conversion projects at existing thermal plants.

The average annual rates of change for energy consumption and the gross value of industrial output that would result from a lower or higher rate of growth in light industry are presented in Table 14. Varying the growth rate in light industry has even less effect on heavy industry than increasing the productivity of energy in heavy industry. Only about a quarter of the change is passed on to heavy industry because of the difference in energy intensity between the two sectors. The change in the light industrial growth rate affects the consumption patterns of the non-industrial sectors only marginally.

TABLE 14.—CHINA: THE EFFECT OF ALTERNATIVE GROWTH RATES IN LIGHT INDUSTRY ON INDUSTRIAL PERFORMANCE, 1980-85

[Average annual growth rates in percent]

	Growth of light industry		
	6 percent	Baseline	10 percent
Availability of primary energy	0.2	0.2	0.2
Consumption of primary energy			
Heavy industry	—2.0	—2.6	—3.3
Light industry	6.0	8.0	10.0
Nonindustrial sectors	—.4	—.6	—.8
Availability of electricity	1.8	2.0	2.1
Gross value of industrial output	2.6	3.5	4.5
Heavy industry	—1.3	—1.8	—2.4
Light industry	6.0	8.0	10.0

V. LONGER-RUN PROSPECTS

We have addressed the likely patterns of energy production and consumption and their effects on industrial growth through 1985. We have concluded that energy constraints alone will slow the industrial growth rate to between 3 and 5 percent annually through 1985, compared with 9.6 percent in 1975–1980. Heavy industry will probably continue its downward drift through the mid-1980s, and even under the best of circumstances, will barely make up for the decline we anticipate in 1981. The tight energy supply, particularly of oil products, will probably force Beijing to intervene repeatedly in the allocation of fuel, implying strong central control.

This general pattern will persist until the energy shortage is relieved. The prospects for coal and offshore oil make the second half of the 1980s brighter. We do not expect offshore drilling to begin on a significant scale until 1983. So far, drilling by the Japanese in the Bohai and by the French in the Gulf of Tonkin and the seismic work done in the South China Sea have been promising.

China's huge and conveniently located coal reserves indicate that Beijing can count on ample longer-term energy availability. This current expansion of the coal industry is the most ambitious since the 1950s, when Soviet technicians guided planning and development. If the technical and financial problems can be overcome, production will expand greatly.

In the 1990s, Beijing will be better equipped to absorb a whole array of new technologies. Coal, the most certain and most extensive fossil fuel in China, will remain the foundation of the Chinese economy. In order to avoid transport problems and the pollution of water and agricultural land, however, Beijing will have to use coal conversion technologies extensively. Thus, Beijing will become increasingly interested in slurry pipelines, environmental controls for direct coal burning, coal gasification and liquefaction, high-voltage AC and DC transmission lines, and the like. Finally, to avoid some of the direct coal requirements of the power industry, China will continue to develop its immense hydroelectric resources and may build at least some nuclear power plants. As a consequence of these trends, China could emerge in the late 1990s with one of the world's most extensive and lowest cost energy systems.

APPENDIX A

DERIVATION OF THE ESTIMATES OF ENERGY AVAILABILITY

A *Primary energy:*

A1 *Total, production, losses, net trade, available:* Derived as the sum of the estimates for hydroelectric power, natural gas, crude petroleum, oil products, and coal.

A2 *Hydroelectricity, production:* Derived from the data in Table A1 and the conversion factor in Table A2.

A3 *Natural gas:*

A3.1 *Production:* Derived from the data in Table A1 and the conversion factor in Table A2.

A3.2 *Losses:* Derived as 2 percent of production for own consumption. Transport and storage losses are assumed to be negligible.

A3.3 *Available:* Derived as production minus losses.

A4 *Crude petroleum:*

A4.1 *Production:* Derived from data in Table A1 and a conversion factor in Table A2.

A4.2 *Losses:* Derived as the sum of own consumption, transport losses and storage losses, which are estimated at 2 percent, 1 percent, and 1 percent of production, respectively.

A4.3 *Net trade:* Derived from official trade data of partner countries, and estimates of trade where official partner trade data are not available.

A4.4 *Refined:* Derived as production minus estimates for losses, net trade, and the amount of crude oil burned domestically.

A4.5 *Available:* Derived from claims concerning the amount of crude oil burned domestically.

A5 *Oil products:*

A5.1 *Crude oil refined:* See crude petroleum, refined.

A5.2 *Losses:* Derived as 8 percent of the crude oil refined.

A5.3 *Net trade:* Derived from official trade data of partner countries, and estimates of trade where official partner trade data are not available.

A5.4–5.5 *Light products available and heavy products available:* Derived from an oil product output model described in CIA, *Chinese Oil: Product Output and Consumption*, ER M 80-10233, 7 May 1980.

A6 *Coal:*

A6.1 *Production:* Derived from data in Table A1, a net output to gross output ratio of .9186, and the conversion factors in Table A2. Chinese coal production is announced in terms of raw coal at the mine mouth, which means reported output contains unculled debris that is not included in published figures for most other countries.

A6.2 *Losses:* Derived as the sum of own consumption and transport losses, which are estimated as 4 percent and 2.5 percent of production, respectively.

A6.3 *Net trade:* Derived from official trade data of partner countries, and estimates of trade where official partner trade data are not available.

A6.4 *Available:* Derived as production minus losses and net trade.

B *Secondary energy:*

B1 *Primary energy consumed:* Derived as the sum of the estimates for hydroelectricity, crude petroleum, heavy oil products, and coal.

B1.1 *Hydroelectricity:* See hydroelectricity, production.

B1.2 *Crude petroleum:* Derived from Chinese claims concerning the reduction in the amount of crude oil burned and the conversion factor in Table A2. The entire reduction is assumed to have been in the electric power industry.

B1.3 *Heavy oil products:* Derived as the total oil consumed by the electric power industry minus estimates for crude oil burned. Estimates for total oil consumed by the electric power industry are derived as follows:

1977: Derived from estimates of electric power generated by oil-fired boilers, and unit fuel consumption estimates for thermal plants.

1978–79: Derived from data presented in Li Rui, "It is Necessary to Develop Hydroelectric Power on a Priority Basis—an Important Question in Our Country's Energy Policy," *Renmin ribao*, 6 March 1980, p. 2, and the conversion factor in Table A2.

1980: Derived from Data in *FBIS*, 3 June 1981, p. K32 and the conversion factor in Table A2.

B1.4 *Coal:* Derived from estimates of electric power generated by coal-fired boilers, and unit fuel consumption estimates for thermal plants.

B2 *Losses:* Derived from the sum of estimates for consumption by hydroelectric and thermal-electric plants, and for transmission losses, and the conversion factor in Table A2. Consumption by hydroelectric plants is derived as 0.16 percent of production, and consumption by thermal electric plants as 6.4 percent of production. Transmission losses are derived as follows:

1977–79: Derived as the electric power consumed by the electric power industry minus the estimates for own consumption by hydroelectric and thermal electric plants. The electric power consumed by the electric power industry is from the United Nations Statistical Office.

1980: Derived as 10 percent of production.

TABLE A1.—CHINA: ENERGY PRODUCTION, 1977–80

	Coal (million tons)	Oil (million tons)	Natural gas (billion cubic meters)	Hydro-electricity (billion kilowatt hours)
1977	550	93.6	12.1	48.3
1978	618	104.1	13.7	45.9
1979	635	106.1	14.5	50.6
1980	620	105.9	14.3	55.8

Sources: Coal, oil, natural gas: United Nations Statistical Office, and State Statistical Bureau, "Communique on Fulfillment of China's 1980 National Economic Plan," issued Apr. 29, 1981, Beijing. Hydroelectricity: Derived from Chinese claims concerning the rate and year-to-year growth of hydroelectric power production. The estimates exclude power from hydroelectric stations of less than 500 KW.

B3 *Electric energy:* Derived from the electric power generated and the conversion factor in Table A2, minus losses. Electric power generation for 1977–1979 is from the United Nations Statistical Office and the Chinese State Statistical Bureau. Electric power generation for 1980 is derived by the model as 299.5 billion kilowatt hours, which differs marginally from 300.6 billion kilowatt hours reported in State Statistical Bureau, "Communique on Fulfillment of China's National Economic Plan," issued April 29, 1981, Beijing Review, No. 19, 1981, p. 23.

B4 *Heat residual:* Derived as primary energy consumed minus the sum of electric energy plus losses.

TABLE A2.—China: Factors for Converting Energy Estimates to Standard Coal Equivalent

	Tons of coal equivalent per unit
Primary energy:	
Hydroelectricity	0.421 to 0.443 per 1,000 kWh.
Natural gas	1.322 per 1,000 m^3.
Oil	1.400 per ton of oil.
Coal:	
Large mines	0.728 per ton.
Small mines	0.696 per ton.
Secondary energy: Electric power	0.125 per 1,000 kWh.

APPENDIX B

DERIVATION OF THE ESTIMATES OF ENERGY CONSUMPTION

The energy consumption estimates presented in Table 3 are derived from independent estimates of fuel consumption by sector where possible. The year 1978—for which the most consumption claims are available—was selected as the starting point for the share-based approach to fuel allocation used in the model. For other years, specific estimates were supplied where the data permitted or where we judged the share-based approach would result in a misleading pattern of consumption. The allocation procedure then fills the remaining gaps in the data.

The productivity of energy was calculated for 1978 from the energy consumption estimates and reported gross value of industrial output. Initial productivity estimates were then made for 1977, 1979, and 1980. These estimates were then adjusted so that energy consumption, industrial output, and electric power supply and demand were consistent.

The derivation of the estimates for energy consumption is described below. Electric energy is converted to standard coal equivalent at the rate of .125 tons per 1,000 kilowatt hours; all other conversion factors are from Table A2.

A *Metallurgy:*

A1 *Primary energy consumed:*

1977 and 1979–80: Derived as the sum of estimates for natural gas, heavy oil products, and coal.

1978: Derived as total energy consumed minus electric energy.

A1.1 *Natural gas:*

1977 and 1979–80: Derived from the model.

1978: Derived by analogy with the use of natural gas in Soviet steel making. The consumption of coal, heavy oil, and natural gas are forced to add to total consumption in steel and other metallurgy.

A1.2 *Heavy oil products:*

1977: Derived from the estimate of 1978 and the increase in crude steel production in 1978 over 1977.

1978: Derived from estimated unit oil consumption in the steel industry. The consumption of coal, heavy oil, and natural gas are forced to add to total consumption in steel and other metallurgy.

1979–80: Derived from the estimate for 1978 and the increases in oil production in 1979 and 1980 over 1978.

A1.3 *Coal:*

1977: Derived from the estimate for 1978, and the increase in crude steel production in 1978 over 1977.

1978: Derived from estimated coal consumption by the steel industry. The consumption of coal, heavy oil, and natural gas are forced to add to total consumption in steel and other metallurgy.

1979: Derived from the estimate for 1978, and the increase in crude steel production in 1979 over 1978, the change in unit coke consumption and the change in pig iron to steel ratio.

1980: Derived from the 1979 estimate and energy conservation claims for the steel industry.

A2 *Electric energy:*

1978–79: United Nations Statistical Office.

1980: Derived from the model on the assumption that unit electric power consumption, remained at the 1979 rate.

A3 *Total energy consumed:*

1977 and 1979–80: Derived as the sum of primary energy consumed and electric energy.

1978: Derived from the share of metallurgy in total energy consumption (*Guangming ribao*, September 1, 1980, p. 2) and the apparent Chinese concept of consumption as net production minus net exports. See Appendix A, Coal Production, for a description of gross and net production.

B *Other heavy industry:*

B1 *Primary energy consumed, natural gas, light oil products, heavy oil products, and coal:*

1977 and 1979–80: Derived from the model.

1978: Derived as energy available minus consumption by electric power, metallurgy, light industry, agriculture, transport, and residential-commercial.

B2 *Electric energy:*

1977–79: Derived from electric power consumption by industry (United Nations Statistical Office), minus consumption by metallurgy and light industry, plus 8.1 billion kilowatt hours—which are not accounted for in the sum of consumption by industry, agriculture, transport, and residential-commercial users.

1980: Derived from the model.

B3 *Total energy consumed:* Derived as the sum of primary energy consumption and electric energy.

C *Light industry:*

C1 *Primary energy consumed:*

1977 and 1979–80: Derived as the sum of estimates for light oil products and coal.

1978: Derived as the sum of estimates for light industry and brigade industry. The consumption of light industry (excluding brigade industry) is derived as total energy consumed minus electric energy; the consumption of brigade industry is derived as the sum of estimates for coal and oil.

C1.1 *Light oil products:*

1977 and 1979–80: Derived from the estimate for 1978 and the growth in the gross value of output for light industry, including brigade industry.

1978: Derived as the sum of estimates for light industry and brigade industry. The consumption of light industry (excluding brigade industry) is derived as primary energy consumed minus coal; the consumption of brigade industry is derived from the gross value of output for brigade industry and the ratio of light oil consumption to gross value of output for light industry, excluding brigade industry.

C1.2 *Coal:*

1977 and 1979–80: Derived from the estimate for 1978 and the growth in the gross value of output for light industry, including brigade industry.

1978: Derived as the sum of estimates for light industry and brigade industry. The consumption of light industry excluding brigade industry) is derived as 7 percent of total coal consumption; the consumption of brigade industry is derived from the gross value of output for light industry, excluding brigade industry.

C2 *Electric energy:*

1977 and 1979–80: Derived from 1978 unit electric power consumption for light industry and the gross value of output for light industry, including brigade industry.

1978: Derived as the sum of estimates for light industry and brigade industry. The consumption of light industry (excluding brigade industry) is derived from the share of light industry in electric power consumption, the share of agriculture in electric power consumption (*Guangming ribao*, September 22, 1979), and electric power consumed by agriculture in 1978 (*Renmin ribao*, 8 September 1979). The consumption of brigade industry is derived from the gross value of output for brigade industry and the ratio of electric power consumption to gross value of output for light industry, excluding brigade industry.

C3 ***Total energy consumed:***

1977 and 1979–80: Derived as the sum of primary energy consumed and electric energy.

1978: Derived as the sum of estimates for light industry and brigade industry. The consumption of light industry (excluding brigade industry) is derived from the share of light industry in total energy consumption (*Guangming ribao*, September 1, 1980, p. 2) and the apparent Chinese concept of consumption as net production minus net exports. See Appendix A, Coal Production, for a description of gross and net production. The consumption of brigade industry is derived as the sum of primary energy consumed plus electric energy.

D *Agriculture:*

D1 *Primary energy consumed,*[10] *light oil products:*

1977–79: Derived as the sum of estimates for oil consumption by tractors and by nonelectrical irrigation and drainage equipment.

1980: Derived from the model.

D2 *Electric energy:* Derived as consumption in agriculture minus consumption by brigade industries (see C2 above). The consumption of agriculture is derived, as follows:

1977: Li Boning, "Feeding One Fifth of the World's People," *China Reconstructs*, April 1979, pp. 55–57.

1978: Renmin ribao, 8 September 1979.

1979–80: JPRS, No. 77182, 15 January 1981, p. 30.

D3 *Total energy consumed:* Derived as the sum of primary energy consumed and electric energy.

E *Transport:*

E1 *Primary energy consumed:* Derived as the sum of light oil products and coal.

E1.1 *Light oil products:*

1977–79: Derived from separate estimates for consumption by passenger and rail freight, and water and highway transport.

1980: Derived from the model.

E1.2 *Coal:*

1977 and 1979–80: Derived from the model.

1978: Derived from estimates of freight turnover, unit coal consumption rates by steam locomotives and the share of rail coal consumption in overall transport coal consumption.

E2 *Electric energy:*

1977–79: Derived from estimates of rail and passenger turnover moved by electric locomotives and unit electricity consumption.

1980: Derived by extrapolating past trends.

E3 *Total energy consumed:* Derived as the sum of primary energy consumed and electric energy.

F *Residential-Commercial:*

F1 *Primary energy consumed:* Derived as the sum of estimates for natural gas, light oil products, and coal.

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[10] Rural coal consumption is contained in the residential-commercial, other heavy industry, and light industry categories.

F1.1 *Natural gas:*

1977 and 1979–80: Derived from the model.

1978: Derived as one-half of the natural gas production.

F1.2 *Light oil products:*

1977: CIA, *Chinese Oil: Product Output and Consumption*, ER M 80-10233, 7 May 1980.

1978–80: Derived from the estimate for 1977 and the trend in consumption since 1956 (Far Eastern Economic Review, January 30, 1958, p. 141).

F1.3 *Coal:*

1977: Derived as the sum of reported residential consumption (*WOCOL* Summary Report—China, prepared by the China Coal Society, September 1979, Beijing) and estimated commercial consumption.

1978–79: Derived as the sum of estimates for urban, rural, and commercial consumption.

1980: Assumed to have remained at the 1979 level.

F2 *Electric energy:*

1977–79: Estimated from electric power consumption by urban residents in the 1950s and the trend in growth of the urban population.

1980: Derived by extrapolating increases in electric power consumption in 1977–1979.

F3 *Total energy consumed:* Derived as the sum of primary energy consumed and electric energy.

THE BAOSHAN STEEL MILL: A SYMBOL OF CHANGE IN CHINA'S INDUSTRIAL DEVELOPMENT STRATEGY

By Martin Weil*

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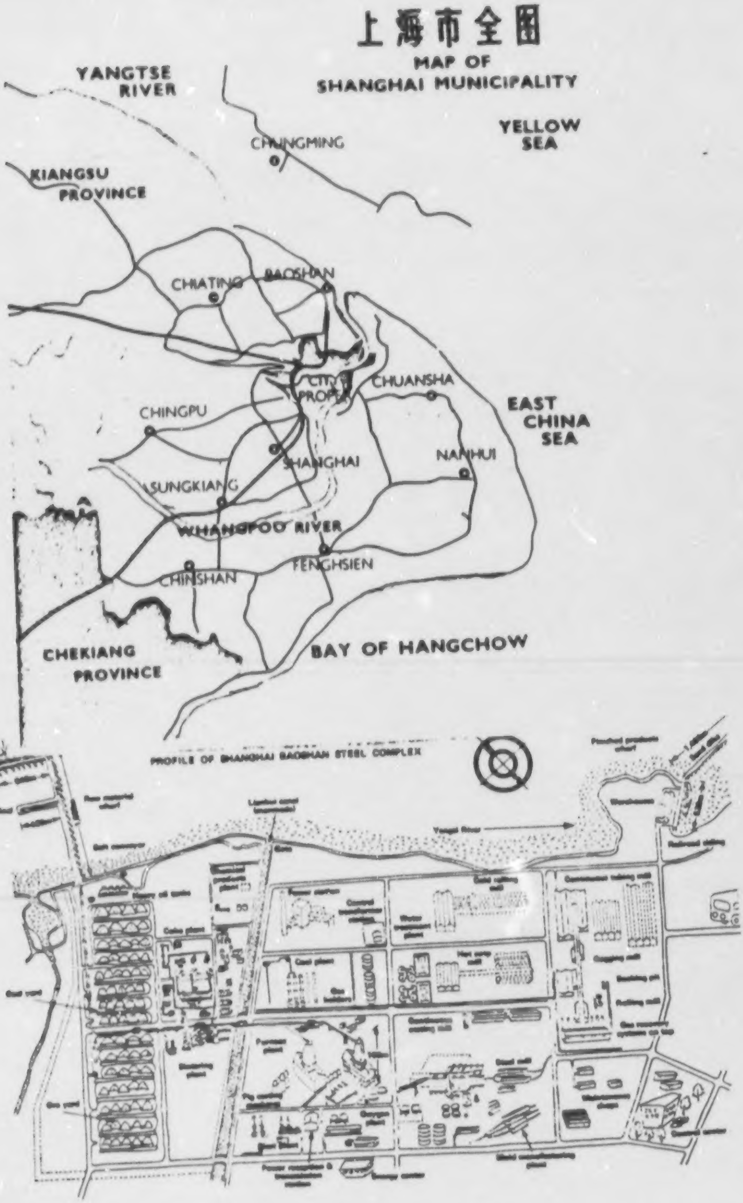
*National Council for U.S.-China Trade, Washington, D.C.

FIGURE I.—Closeup of Baoshan


上海市全图
MAP OF
SHANGHAI MUNICIPALITY
YANGTSE
RIVER
YELLOW
SEA
CHUNGMING
KIANGSU
PROVINCE
CHIATING
BAOSHAN
CITY
PROPER
CHUANSHA
EAST
CHINA
SEA
CHINGPU
SHANGHAI
NANHUI
SUNGKIANG
WHANGPOO RIVER
FENGHSIEN
CHINSHAN
CHEKIANG
PROVINCE
BAY OF HANGCHOW
PROFILE OF SHANGHAI BAOSHAN STEEL COMPLEX

Source: JETRO China Newsletter, March–April 1981, p. 4.

I. INTRODUCTION

Construction of the Baoshan Steel Mill began in 1978 as a symbol of China's drive to develop one of the world's advanced industrial economies by the year 2000. The projected six million ton per year Shanghai-area plant was to be the linchpin in the expansion of the industry viewed as the key link in overall development. It was also designed to be a showcase example of gaining access to state of the art technology through cooperation with foreign companies.

By 1982, however, Baoshan has become synonmous with difficulties and setbacks encountered in the modernization drive, and with the abandonment of goals and changes in priorities. After spending billions of dollars on the plant, Chinese leaders have concluded that it should never have been built in the first place. Construction has virtually stopped in midstream, as leaders debate how much of it should be salvaged. Even under the most optimistic scenario, the plant is unlikely to reach its designed capacity until at least 1987 (5 years beyond the originally targeted completion date), if ever. The investment made is unlikely to be recovered for many years. The suspension of several contracts with foreign companies for the project has tarnished China's reputation as a reliable trading partner.

There is no simple explanation for Baoshan. Some of its difficulties stem from inherent flaws in its conception, which suggest important defects in the planning system. But most of the controversy over the plant is connected with larger policy issues, such as what China's industrial priorities should be, and what role foreign companies should be allowed to play in China's economy. Above all, Baoshan's turbulent history shows how greatly economic planning and political struggle have affected each other.

II. THE RATIONALE FOR BAOSHAN

A. RAPID STEEL EXPANSION

Zhou Enlai is reported to have nurtured a long-time dream of constructing an integrated steelworks along the China coast.[1] Baoshan's more immediate origins, however, lie in the optimism in high-level planning circles in 1977, the year following Mao Zedong's death and the downfall of the Gang of Four. At last, it seemed then, China could get on with the business of realizing Mao's and Zhou's "four modernizations," after years of turmoil and stagnation caused by the Gang's emphasis on political purity and "revolution." The economy was already beginning to rebound by mid-1977, and would do so with greater vigor in the months to come; industrial growth in 1977–1978 averaged 14 percent.

In this atmosphere of rejuvenation, top political leaders drafted a 10-year development plan, 1975–1985 (hereafter referred to as the "four modernizations" plan), which was unveiled in bits and pieces at a series of meetings in 1977, and was finally made public by then-Premier and Chairman Hua Guofeng at the first session of the fifth

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[1] Takashi Oka, "Sino-Japanese Ties Stumble Over Shanghai Steel Project," Christian Science Monitor, June 11, 1981, p. 11.

National People's Congress in early 1978. This ambitious plan called for 10 percent annual industrial growth through 1985, and the completion of 120 major construction projects. It also targeted the commissioning of "ten more Daqings"—referring to the oilfield which produced nearly 50 million tons in 1978 and had become a political symbol of the potential for rapid growth. It is not coincidental that top planners such as then-Planning Commission Chairman Yu Qiuli had been associated with the apparently successful Daqing program; the experience colored their optimism.

It was inevitable that steel would be central to the new plan. Recent accounts of the planning process suggest that Mao's 1950's dictum to "take steel as the key link" was followed literally until 1979. Planners would set a steel target before any other, and predicate other major targets on the resource requirements of steel. Difficulties in meeting targets would be attributed to the lack of steel, continuing the cycle.[2] Steel was always the first sector to be assured of funding, accounting for nearly 9 percent of total capital construction investments, 1958–1978.[3] As in many other developing countries, steel was the symbol of wealth and status.

Steel's importance in the four modernizations plan can be gauged from the fact that the 1985 steel target of 60 million tons was the only target for a specific industrial commodity that Hua made public. This implied a growth rate of 12.9 percent per year over the 1977 output level of 23.74 million tons. Growth from 1965–1977, by contrast, averaged only 5.7 percent per year,[4] and the average absolute increase during that time was only 21 percent of the 4.6 million tons per year that would have been required to meet the 1985 target.

Obviously, this was at best an extremely difficult, and at worst an impossible target. One of the key dynamics behind the adoption of such targets was laid out in a People's Daily editorial in 1978: "Like all other targets, 60 million tons of steel represent a force that will keep driving us forward. It is also the behest of Chairman Mao and Premier Zhou."[5] In other words, many leaders viewed high targets as political spurs to action as much as rational, concrete economic plans. Or, targets might simply be ambitious figures mentioned in a casual way by a high-level leader such as Mao or Zhou. The tendency for targets to become little more than political rallying cries had been most marked during the Great Leap Forward. Although it was not as extreme in 1978 as it had been 20 years earlier, the PRC's tradition of politically motivated high targets was an important factor behind the 60-million-ton steel figure.

One other major element in the rationale for rapid steel expansion was import substitution. Despite the historically high rate of investment in steel, imports of finished steel products in the 1970's accounted for a larger proportion of China's total foreign purchases than any other single commodity. Between 1975 and 1979, these imports amounted to approximately $10.2 billion, or about 21 percent of total imports. In 1978, finished product imports reached 8.64 million tons, or over 33 percent of China's finished steel output.[6]

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[2] People's Daily, Apr. 6, 1979, p. 3, monitored by U.S. Government Foreign Broadcast Information Service (FBIS). China Daily Report, Apr. 19, 1979, pp. L7–8.

[3] Wang Dingyong, "On the Position of Steel in the National Economy", Jilin Daxue Shehui Kexue Xuebao (Jilin University Journal: Social Sciences Edition) in Chinese, No. 2, 1980, pp. 21–29, translated in U.S. Government Joint Publication Research Service (JPRS) No. 76447, Sept. 18, 1980, p. 39.

[4] Growth rates 1965–77 calculated from offical State Statistical Bureau figures. See also Martin Weil, "The Iron and Steel Industry in China: Perspectives and Prospects," Metal Bulletin, London, 1980, p. 5.

[5] People's Daily, May 19, 1978, translated in FBIS May 23, 1978, p. E2.

Officials in the Ministry of Metallurgical Industry, the central bureaucracy responsible for the steel industry, correctly figured in 1977 that more than 10 million tons of additional steel production could be obtained through fuller utilization of existing capacity.[7] They planned for the bulk of the remaining capacity to be added through 10 major capital construction projects. Of the 10, 7 or 8 were to consist of expansion of existing large mills. The other 2 or 3 were planned as new "greenfield" complexes. The ambiguity in the number of greenfield plants reflected underlying political controversy over the issue of expansion of old plants versus the supposedly more expensive process of building new ones.[8] But by late 1977, one thing was definite: Baoshan, one of the new plants, had the highest priority of any of the steel projects.

B. IMPORTED TECHNOLOGY AND EQUIPMENT

It was apparent to China's leaders that domestic steel technology, based largely on what had been imported from the Soviet Union in the 1950's, was insufficient to meet the 1985 goal. As of 1977, China had succeeded in constructing only one integrated steelworks without foreign assistance—the 1.5 million ton Panzhihua Plant located in Dukou, Sichuan Province. This task had required more than 10 years work.[9]

China's largest blast furance in 1978 was 2,500 m³, and its largest basic oxygen furance 150 tons/heat, compared to the 4,000 m³ and 300 ton units found in the West and Japan. But it was in the finishing sector that China's technology was weakest. By the mid-1970's, finished steel production was averaging only about 70 percent of crude steel output, whereas in Japan, the figure is close to 80 percent.[10] The deficiencies were particularly marked in steel sheet and strip, and in seamless tubes which are used in oil drilling. These products topped China's import lists. In terms of quality, as well as quantity, China's production left much to be desired. Thus, it is not surprising that foreign equipment and technology were targeted for Baoshan.

From the PRC's founding, its leaders favored purchase of complete plants as the way to obtain access to advanced heavy industrial technology. This approach was implemented in a big way with the Soviet Union in the 1950's, and in a more modest fashion with Western Europe and Japan in the 1960's. In the early 1970's, much larger scale purchases were made under the so-called "43 plan", which involved the commitment of $4.3 billion to buy key plants for a number of industries (only about $3.7 billion was actually spent in the end).

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[6] Import data obtained from combination of Chinese Government sources and U.S. Government National Foreign Assessment Center estimates. See NFAC "China: International Trade Fourth Quarter 19[illegible]," p. 15 and "China: The Steel Industry in the 1970's and 1980's." ER79-10245, May 1979, p. 6.

[7] Zhou Chuandian (Vice-Minister of Ministry of Metallurgical Industry), "Tapping the Potential is the Direction for Growth in China's Steel Industry," Gongren Ribao, (Workers Daily), Beijing in Chinese, July 7, 1980 p. 3, translated in JPRS 76447, Sept. 18, 1980, p. 4.

[8] Japan Kyodo News Service English language broadcast, Aug. 24, 1978, monitored by British Broadcasting Service Summary of World Broadcasts Far Eastern Weekly Economic Report (SWB) Sept. 6, 1978, p. A17.

[9] New China News Agency, Beijing (NCNA) in English, SWB Sept. 23, 1979, p. A13. See also Voechst-Alpine, Austria Co. "L-D Process Newsletter" No. 71, March 1981, Linz, Austria.

[10] Data obtained from official sources. See also Weil, loc. cit.

One of the purchases foreshadowed Baoshan. This was a $500 million complete steel finishing complex for the Wuhan mill (which had been left unfinished by the Soviets in 1960) bought from West German and Japanese firms in 1974—including a continuous caster, hot and cold strip mills, a silicon sheet mill, and galvanizing and tinning lines, all designed according to the most sophisticated technology available in the world.[11]

Purchases had been curtailed during the 1975–1976 period, owing largely to the opposition by the Gang of Four to foreign technology import on ideological grounds of self-reliance and nationalism. Although self-reliance had been an official policy since 1960, selected purchases of complete plants had been considered compatible with the strategy before the Gang became so powerful, because buying a complete plant would supposedly enable China to construct future facilities on its own.

After the most virulent opposition to plant imports was removed with the Gang's downfall, planners moved again to expand complete plant purchases. By 1978, $12.4 billion was targeted for 22 key plant import projects, mainly in the metallurgical and chemical industries. Of these, Baoshan was the largest project.[12] Numerous other projects in various industries were being promoted by the interests concerned, as China's bureaucracies rushed to take advantage of the unprecedented opening to the West. Western plant and technology were viewed as a virtual panacea for the achievement of the four modernizations.

C. SHANGHAI LOCATION

Planners made a conscious break with the past in choosing Shanghai as the site of the highest priority new steel mill. In the 1950's and 1960's, sites in the interior, such as Wuhan, Baotou, and Panzhihua had been chosen, as political leaders tried to spread wealth more evenly around the country and diminish the importance of coastal areas contaminated with Western and Japanese influence. Reducing the plants' vulnerability to attack from first the United States and later the Soviet Union was also a consideration. The disadvantages of building in such hinterland areas as Baotou and Panzhihua were considerable, as infrastructure was lacking and consumption centers were far away.

On the other hand, Shanghai (as well as Eastern Hebei, or Jidong, the location tentatively chosen for the second priority new steel plant) was a major industrial area with well-developed infrastructure, high demand for steel, and plentiful supply of skilled labor. There were no known iron ore sources near Shanghai. But as a major coastal seaport, Shanghai was assumed to be ideal for use of imported ore.

The use of imported ore at Baoshan, at least during plant startup, appears to have been planned from the beginning. Officials of the National Council for US-China Trade were told of the decision as early as September 1977. Importing ore for Baoshan made sense for several reasons. China was unable to produce all the iron ore it needed for its existing plants; in 1978, for example, eight million tons (or about 7 percent of China's production) were imported from Australia and North Korea. Imported ore was also necessary for technical reasons. In contrast to Australian ore, which is high enough quality to be charged into blast furnaces with little processing, China's almost uniformly low-grade ores require a type of upgrading known as pelletization to be used with any efficiency in large sophisticated blast furnaces. China had virtually no pelletizing facilities in 1977, and little prospect of constructing them quickly enough to meet Baoshan's timetable.

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[11] William Clarke, "China's Steel," China Business Review, National Council for U.S.-China Trade, Washington, D.C. volume 2 No. 4, 1975, p. 40; "43" plan described in Chen Weiqin "The Direction of Introducing Technology Should be Changed," Economic Management. Beijing No. 4, Apr. 15, 1981, translated in SWB June 24, 1981, pp. C1–C5.

[12] Ibid.

Site selection in the PRC has always been a highly politicized process, and there were undoubtedly political reasons as well for the selection of Baoshan County, about 30 km. from Shanghai proper along the Yangzi River estuary. It is extremely difficult, however, to determine what exactly these were. Informed companies report persistent rumors from Chinese sources that pressures from Shanghai political interests, which wield considerable clout by virtue of the city's economic importance. were instrumental in locating the mill within the Shanghai municipal boundaries. US companies negotiating other projects have found that local interests can exercise considerable power in determining the exact site; for example, at one point in the ultimately fruitless efforts during 1978–1980 to obtain a contract to build a foreign trade center, three firms were forced by the Beijing Municipal government to move the prospective site 20 km. away from its original choice downtown location.[13]

A report in a Hong Kong magazine, which is thought to have good connections in Beijing, suggests that the choice of Baoshan was the responsibility of a high ranking central "superior official" connected with the project. The report indicates that Baoshan was originally designed to be only an iron mill, but that this official arbitrarily expanded its scope, because "his appetite was too big." [14]

Perhaps the reports of local pressures, and the machinations of "superior officials" are both partially true. It was to become clear in the course of events that there had been considerable opposition to the choice of site from the start.

By mid-1978 at the latest, one of the major elements in the rationale for the Baoshan location had already been undermined. It had become clear that the Yangzi estuary would be too shallow to unload 100,000 ton ore freighters directly, as originally planned, without expensive and time-consuming dredging. Rather than move the site, however, the Chinese elected to build a new ore port at Beilun, Zhejiang Province, about 130 km. south of Baoshan, from which ore would be transshipped to Baoshan and other plants.[15] While this involved some extra construction expense, it seemed to solve the problem.

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[13] Frank Ching, "China Won't Build Foreign Trade Center; Friction Between Bureaucrats Blamed," Asian Wall Street Journal. Sept. 26, 1980.

[14] Lin Shen, "The Inside Story About China's Readjustments," Cheng Ming, Hong Kong in Chinese No. 19, May 1, 1979, p. 10, FBIS May 10, 1979. pp. U1–U2.

[15] Kyodo News Service, Sept. 12, 1978, in Shipping and Trade News, Tokyo, Sept. 13, 1978.

III. BAOSHAN'S HISTORY

A. COOPERATION WITH JAPAN, 1978

The chain of events that were to lead to Japanese involvement in Baoshan began in September–October 1977, when Vice-Premier Li Xiannian requested technical assistance in steel development from a high-level private Japanese trade delegation, and when a Metallurgical Ministry delegation led by the Vice-Minister directly in charge of Baoshan paid a long visit to Japan. Discussions continued in the context of quasi-governmental negotiations for a long-term trade protocol involving the exchange of $10 billion of Japanese plant, technology, and materials for a comparable amount of Chinese oil and coal, which was signed in February 1978. As numerous delegations flowed between the two countries, it became apparent that China was interested in assistance in developing 4 or 5 steel mills, but that Baoshan was the highest priority.[16]

A number of Japanese companies were contacted, but in response to the Chinese preference to coordinate the bulk of the project through a single company, as well as the behind-the-scenes encouragement of the Japanese government, Nippon Steel—Japan's largest manufacturer—quickly assumed the lead in the negotiations. The Chinese were already familiar with Nippon through its involvement in the Wuhan rolling mill project, and were aware of its reputation as one of the world's most advanced steelmakers.

Following several months of discussion, Nippon formally signed a contract defining its role in the project on May 23, 1978 with the China National Technical Import Corporation (also known as CNTIC, or TECHIMPORT, a subsidiary of the Ministry of Foreign Trade acting in essence as a purchasing agent with no technical responsibility). The contract called for Nippon to design a six million ton per year plant from raw material unloading to the production of semi-finished products, which was to be modeled on the company's ultramodern Oita works. An accompanying protocol gave the company a supervisory role in equipment installation and construction management as well. This kind of mandate was unprecedented for a Western company in China, and reflected the premium the Chinese attached to the speed of construction. Although no specific timetable was laid out, Japanese press reports indicated that the Chinese hoped to commission the first three million tons of capacity by 1980.[17]

A complicated arrangement was worked out for supply of the equipment, which was to include two sets of coking ovens, two 4000 m^3 blast furnaces, three 300 ton basic oxygen furnaces, a continuous casting machine and a blooming mill for the production of semi-finished products, and various auxiliary facilities. Nippon was to line up suppliers for 10 of 19 major facilities, such as the blast furnace and coking ovens, while recommending other companies for the Chinese to negotiate with directly for the continuous caster, an oxygen plant, a 700 megawatt power plant and other auxiliary facilities.[18]

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[16] Takashi Oka, loc. cit.; Japan Economic Journal, Tokyo Feb. 21, 1978, p. 1 and Feb. 28, 1978, p. 5.

[17] Journal of Commerce, New York, May 11, 1978, p. 31; Mainichi Daily News, Tokyo, June 25, 1978; NCNA in English, May 23, 1978, FBIS May 24, 1978, p. A8.

[18] Mainichi Daily News, loc. cit.

These arrangements seem to have been designed to give the Chinese the benefit both of Nippon's design skills, and of having direct contact with as many companies as possible.

The Chinese elected to construct Baoshan's finishing mills outside the context of the agreement with Nippon. Baoshan was targeted to include a 400,000 ton per year seamless pipe mill, a four million ton hot strip mill, and a two million ton cold strip mill. Pipe and strip, of course, were the product lines for which China's domestic technology was weakest, and imports were highest. A bid was solicited from Sumitomo for the pipe-plant by mid-1978.[19]

Nippon Steel's role was limited in other ways as well. Most importantly, according to reports, it was given no role in determining the basic feasibility of the plant. The site was already a fait accompli by the time it was first presented to the company in late 1977, although the company did conduct tests at the site, point out some of the deficiencies and advise the Chinese how to overcome them. As for coking coal, Nippon was apparently asked to give advice on the suitability of various Chinese coals—but the ultimate decision lay with the Chinese.[20]

The complex was to be constructed in two phases, each phase centering around one blast furnace. The Chinese hoped to sign equipment contracts for Phase I by fall 1978. The total cost in foreign exchange was estimated at $5 billion.[21]

As 1978 progressed, the Chinese plunged into preparatory site work: laying roads, digging canals, building workers' housing.[22] Orders were placed in July with Japanese firms for the 300,000 tons of steel piles that Nippon Steel had calculated would be necessary to support the foundation in the soft ground at Baoshan.[23] The first equipment purchase commitment was made in November with Mitsubishi for the coal-burning power plant.[24]

At the same time, the tentative plans for the second large new steel complex in Eastern Hebei (Jidong) were made known to major steel firms throughout the world, who were asked to submit proposals for the prospective 10 million ton plant.[25]

The steel expansion program, however, ran into delay when the fall target for Baoshan equipment purchases came and went without any action. Part of the delay seems to have resulted from the complexity of the technological arrangements with Nippon, in particular lining up the various equipment suppliers.[26] Of equal significance was the very tough commercial bargaining taking place between the Chinese and Japanese sides. The Chinese were insisting not only on low prices, but also on payment in dollars rather than in the stronger Japanese yen.[27]

These negotiations were taking place in the larger context of the issue of financing all the major plant purchases from Japan and elsewhere contemplated under the four modernizations plan. There was probably already some inkling that foreign reserves and oil exports would not prove sufficient to pay for plant imports in the short run. Chinese leaders thus sent signals in late 1978 that the country would drop its rigid ideological resistance to accepting direct foreign loans. Negotiations for a large loan were begun with a group of Japanese banks, but they proved as difficult as the Baoshan negotiations themselves—for reasons probably involving domestic dispute within China over the issue, as well as the traditional Chinese tough bargaining stance.[28] In retrospect, the difficulty in the commercial negotiations was an indicator of behind the scenes opposition to Baoshan, and to the ambitious plant import program in general.

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[19] Japan Economic Journal, May 23, 1978, p. 7.

[20] David Bonavia, John Lewis, and Anthony Rowley, "The Battle of Baoshan," The Far Eastern Economic Review, Hong Kong, Feb. 20, 1981, pp. 49–57.

[21] Journal of Commerce, loc. cit.

[22] Shipping and Trade News, Tokyo, Sept. 13, 1978.

[23] Japan Economic Journal, July 18, 1978, p. 6.

[24] China Business Review, Washington, D.C., vol. 5, No. 6, 1978, p. 79.

[25] Kyodo News Service, Aug. 24, 1978, SWB, Sept. 6, 1978, p. A17.

[26] Japan Economic Journal, Oct. 17, 1978, p. 6.

[27] Japan Economic Journal, Dec. 19, 1978, p. 1.

Despite the fact that the financing issue remained unsettled, Baoshan took a significant step forward on December 23, 1978, when contracts were signed for those facilities in Phase I (i.e., the set of upstream and downstream facilities centered around the first blast furnace, with capacity of three million tons of iron and steel) for which Nippon Steel was directly responsible, totalling approximately $2 billion (see Appendix A). The agreement was half yen and half dollar, representing a compromise that was to be a prototype for all future Baoshan contracts. Surprisingly, in view of the financing problem, payment was to be in cash.[29]

The timetable set out in the contract envisaged completion of Phase I by October 1981, and of the full plant by 1984. Immediately upon signing, foundation pile-driving work began at Baoshan.

At approximately the same time, several billion dollars of contracts were signed with Japanese and European firms for other metallurgical and petrochemical projects, all also for cash. One possible explanation as to the coincidence in timing is that central authorities had given approval to sign the contracts in 1978, but wanted negotiators to drive the hardest possible bargain. In view of what was to happen barely two months later, it is tempting to speculate that part of the reason was that the interests behind the plants wanted to act before the political and economic climate changed.

B. FIRST CHALLENGE TO BAOSHAN : SUSPENSION OF CONTRACTS, FEBRUARY–JUNE 1979

On February 22, 1979, CNTIC suddenly notified Japanese trading companies involved that implementation of the recently signed Baoshan equipment contracts was to be halted—under a clause in the contracts permitting the government of either country to suspend them by withholding approval within 60 days after signing. This clause, ironically, was originally inserted into Sino-Japanese plant contracts at the urging of the Japanese side.

At the same time, the Chinese similarly suspended 21 other contracts with Japanese companies, worth approximately $1.5 billion. The stated reason for the suspension was the failure of the Japanese commercial banks to agree on loan terms. This was not the last time, however, that the Chinese were to be less than straightforward with their trading partners.[30]

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[28] Ibid.

[29] Kyodo News Service, Dec. 22, 1978 in English, SWB Jan. 1, 1979, pp. C1–2.

In reality, the contract suspensions were a part of the abrupt and fundamental shift in economic policy that would become known as "readjustment". Explanations of this shift, which marked the effective abandonment of the four modernizations plan, first appeared in the Chinese media at precisely this time in late February 1979.

The origins of this change were complex. Certainly, after a year of frenzied activity at home and abroad, political leaders had a better sense of the difficulties and costs of meeting the plan's impossible targets. Central authorities had to be alarmed at the uncontrolled rush of various interests to spend foreign exchange, and the pressures and expectations that modernization rhetoric were producing.

Moreover, the results of the trial run for the four modernizations plan—the "43" plant import scheme of the mid-1970's—were beginning to come in, and they were far from encouraging. The bulk of the plants were running at least one year behind their construction schedules. Of the 17 that had been completed by 1978, 6 were running under 50 percent of capacity, for reasons ranging from energy and raw materials shortages to inability to assimilate technology.[31]

The most notorious case was the Wuhan steel rolling mill. Due to acute electricity shortage, it could only operate at about 20 percent of capacity. The lack of argon for the thermoregulator of the continuous caster put that machine out of commission. Wuhan did not produce enough steel to run the mill at full capacity, and there was no silicon steel at all for the silicon steel mill.[32]

Political change at the top was a most important factor behind the policy shift, and was to continue to be an important dynamic throughout Baoshan's history. The 1979 readjustment followed close on the heels of the pivotal third plenum of the 11th Central Committee in December 1978, which weakened Chairman Hua's power and, most importantly, brought veteran Chen Yun back from obscurity to his old position of the 1950's as the Party's number one economics expert. Chen, whose trademark had been opposition to extravagant, rash industrial development schemes since the days when he fought Mao's Great Leap Forward, was clearly the strongest force behind the new policy, and can be said to have been Baoshan's most powerful and persistent opponent.

Virtually all of the most important principles of Chen's readjustment policy, as they were laid out in early 1979, seemed to undermine the rationale for Baoshan:

(1) *Unrealistically high output targets should be lowered.*—Far from spurring productive growth, it was argued, pursuit of such targets would lead to chaos and waste that would actually slow down the rate of growth in the long run.

(2) *The scale of capital construction must be reduced.*—Press articles began to argue that construction was spread out among too many projects, with the result that none of them could be completed in a

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[30] Kyodo News Service in English, Feb. 24, 1979, SWB Mar. 7, 1979, p. A15.

[31] Chen Weiqin, Economic Management, loc. cit.

[32] Meng Xiancheng, "My Thoughts on the Importing of a 1.7 Meter Rolling Mill by the Wuhan Iron and Steel Company," People's Daily, Aug. 1, 1980, p. 1 in Chinese, FBIS, Aug. 15, 1980, p. L11.

timely fashion. Calls were made to halt projects "where resources and geological conditions are uncertain, where technology is not up to production needs, or where the supply of fuel, power, or raw materials cannot be guaranteed." [33]

(3) *Imports of complete plant and equipment are misguided.*—This concept was grounded partially in practical considerations of cost and foreign exchange availability. But it also reflected the lingering influence of the Maoist self-reliance ideology. In early 1979, no one was taking a position as extreme as the Gang of Four's opposition to the import of foreign technology on principle, but many felt that buying complete plants was going too far in the other direction. As the People's Daily put it:

> In importing technology and equipment, we must oppose the idea that foreign equipment is invariably better than our own, the tendency to import everything and the mentality of looking down on ourselves . . . We should not buy things from abroad which can be made at home, import complete sets of equipment when we can produce part of the equipment ourselves. By buying more patents and manufacturing techniques in light of our actual needs, we must build up our own strength so as to have a developed machine-building industry of our own which will gradually provide . . . complete sets of equipment.[34]

There was also the hint that the most sophisticated technology was not necessarily the most appropriate.

(4) *Developmental priorities must be shifted away from heavy industry.*—Chen and his followers argued that resources must finally be transferred—in fact as well as rhetoric—to agriculture and consumer goods industries. This would have a more immediate impact on standards of living, provide a quicker return on investment, and increase labor absorption and exports. Bottlenecks in energy and infrastructure were already serious, and the emphasis on high energy consuming industries was bound to make them worse. As for steel, according to a People's Daily editorial of February 24, 1979:

> Under no circumstances should the slogan "Take steel as the key link" be used to set the targets for steel production arbitrarily . . . For many years, we have stressed investment in steel, both financial, material, and in terms of manpower. But results have been slow. At present, it is essential to . . . improve the weak links in industrial production such as coal, electric power, transportation, and building materials and develop the items people urgently need in their material and cultural lives . . . Steel investments should be proportionately reduced, and a critical examination of low economic efficiency in the iron and steel industry should be made.[35]

The impact of readjustment on the steel industry was soon apparent. Plans for all of the projects not yet initiated—such as the new Jidong plant, and the expansion of several existing mills under discussion with foreign firms were shelved in the spring of 1979.[36] The 1985 steel target was unofficially reported by several Chinese government officials to have been lowered to 45 million tons.[37] In June, the 1979 steel target was set at 32 million tons, virtually the same as 1978 output.

Although the issue was never discussed directly in the PRC press, a move was clearly afoot at this time to halt Baoshan as well. Logic would have dictated such a move, as Baoshan seemed to represent everything that the advocates of readjustment opposed: it was a large construction project, an imported complete plant, and a steel mill. In addition, specific problems with the plant, which had aroused opposition from the beginning, suddenly began to come to light through the rumor mill, and through reports in the Hong Kong press. One was the issue of ore unloading, and the new port. Then, there was the softness of the ground, which had necessitated the purchase of 300,000 tons of piles.[37a]

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[33] Address by Vice Premier Gu Mu to National Capital Construction Meeting, reported by NCNA in English, Mar. 28, 1979, FBIS Mar. 29, 1979, p. L10.

[34] People's Daily editorial, May 8, 1979 in Chinese, translated by Beijing Review, Beijing, June 1, 1979, pp. 11–13.

[35] Translated in FBIS, Feb. 26, 1979, pp. E12–E16.

[36] See Weil, loc. cit., pp. 65–67.

[37] Kyodo News Agency, June 26, 1979, FBIS, June 28, 1979, p. L13.

Imported iron ore, it was to become clear, was another issue which aroused opposition to Baoshan. Although the high quality ore was needed for technical reasons, the break with self-reliance still struck sensitive political nerves (see Section III. D. below).

One sign of the plant's clouded status lay in the fact that the Chinese broke off all substantive discussions about reviving the contracts with Nippon Steel in late March, 1979.[38] A somewhat firmer indication is the description in a Hong Kong magazine of a purported speech by Vice-Premier Li Xiannian to an important Party leadership work conference in April which discussed details of readjustment:

> The Baoshan iron and steel plant in Shanghai . . . needed an investment of $20 billion (sic). This sum could be used to build 500 light industrial factories. The Baoshan iron and steel plant planned to purchase iron sand from Australia. Australia is a long distance and a large amount of freight would be involved. Raw material supplies cannot be guaranteed. The construction of such a large plant cannot be completed in 1 or 2 years and profit cannot be guaranteed after it becomes operational. Its foundation work has now been started and should be temporarily delayed until the conditions for reconstruction are right.[39]

A Hong Kong magazine with strong ties to reformist elements in Beijing speculated in May that a decision had been taken to at least slow construction of Baoshan down.[40]

Yet, at the same time, there was a strong lobby that continued to fight for the plant. This "heavy industry" lobby's existence, and its tactics, reveal why so much that happened during 1979–1980 went against the wishes of readjustment advocates, despite the fact that readjustment was the official policy. Top officials in the state planning apparatus, including then Planning Commission Chairman and Politburo member Yu Qiuli can be presumed to have been part of the lobby. Yu was later to be labelled a key member of the so-called "petroleum clique" of planners, pursuing a policy of "enthusiastically building large chemical, petroleum, and iron and steel industries, neglecting agriculture and light industry, showing no concern for the actual life of the people, and failing to attach importance to comprehensive balance." [41] This group had the support of others in the Politburo, including then-Chairman Hua Guofeng, judging by the fact that he chose to give an "important speech" of support during an "inspection tour" of Baoshan in June 1980.[42]

[37a] Objectively speaking, the combination of the shallowness of the estuary and the softness of the ground make Baoshan a less than ideal site for a steel mill. Many Japanese steel experts feel, however, that it is easy to exaggerate the problem, and point out that Japanese mills are built on similar type of ground. The piles necessitated several hundred million extra dollars of construction expenses, but once they are in place, it is generally agreed, the plant could operate. The worst that might happen, in one US expert's view is that there would be occasional shifts in the position of the foundations, which might require bothersome adjustments to the position of the machinery. Whatever the extent of the economic problems caused by the site, however, these problems provided political ammunition to the plant's opponents.

[38] Japan Economic Journal, Mar. 20, 1979, p. 7.

[39] Ming Pao, Hong Kong in Chinese, June 14, 1979, p. 4, FBIS, June 19, 1979, p. L11.

[40] Lin Shen in Cheng Ming, May 1, 1979, loc. cit.

[41] Lo Bing, "Yu Qiuli Deprived of Part of His Power—Second Part of Random Notes on a Visit to the North," Cheng Ming No. 33, July 1, 1980, pp. 7–8, FBIS Sept. 1, 1980, p. U3; Liu Yu, "A Big Reorganization is Brewing in the State Council," Cheng Ming No. 38, Dec. 1, 1980, FBIS Dec. 2, 1980, p. U1.

A prominent spokesman for this group was Vice-Premier Gu Mu, who was head of the State Capital Construction Commission, and thus directly responsible for Baoshan's construction. Gu told visiting Japanese in April 1979—a time when other reports suggest that the plant was being debated—that Baoshan would be given top priority to strengthen the national defense buildup.[43] This suggests that military elements were also part of the lobby for a new sophisticated steel plant—even though Baoshan's end products would have had no direct military application. Key Shanghai politicians remained strong Baoshan boosters as well, judging by Shanghai media reports on progress in construction.[44]

The position of Deng Xiaoping, a key figure, is difficult to fathom. Deng had identified himself with Baoshan during a trip to Japan in August 1978 by paying a visit to Nippon Steel's Kimitsu plant. In 1979, a rumor began circulating that Deng had blasted Japan for shipping a defective secondhand pile driver to Baoshan—an accusation which has been vigorously refuted by the Japanese, who point out that China had specifically requested the used pile driver. It would not have been out of character for the wily Deng to shift any blame for his own role in Baoshan to the Japanese, who were to be made scapegoats for what seem to have been primarily Chinese mistakes or misunderstandings.

Yet, paradoxically, Deng was and is one of the Chinese leaders most committed to economic and political cooperation with the West and Japan. The potential damage to China's foreign economic relations was undoubtedly one of the major arguments put forward in favor of continuing with Baoshan—while at the same time, Chinese negotiators attempted to squeeze better commercial terms out of the Japanese to satisfy domestic critics. The import substitution argument was also raised in defense of Baoshan, with Metallurgical Ministry officials issuing dire predictions regarding China's steel import bills.[45]

The interests also appear to have employed the time-honored tactic of creating a fait accompli. Media reports reveal that throughout the period when the contracts were suspended, foundation and pile-driving work was proceeding at a rapid clip, which made the plant more expensive to halt with each passing day.[46]

By accepting some compromises, the Baoshan lobby was able to temporarily neutralize Chen Yun and his followers. It was agreed that the complete plant formula would be modified in future contracts. A somewhat extended construction timetable may also have been set. A decision, however, was made at the highest political levels by the end of April to continue construction of the project.

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[42] Shanghai Municipal Radio in Chinese, June 15, 1980, FBIS, June 16, 1980, p. L5.

[43] Kyodo News Service in English, Apr. 20, 1979, FBIS, Apr. 23, 1979, p. D1.

[44] See for example Shanghai Municipal Radio Mar. 29, 1979, FBIS Apr. 10, 1979, p. O5.

[45] See, for example, report of Metallurgical Minister to 3d session of Fifth National People's Congress, NCNA in Chinese, Sept. 4, 1980, FBIS Sept. 5, 1980, p. L3.

[46] NCNA in Chinese Apr. 10, 1979, and in English Apr. 12, 1979, SWB May 23, 1979, p. A12.

The most pressing problem was solved when the loan agreement was finally reached with commercial Japanese banks in mid-May, on virtually the same terms the Japanese had offered several months earlier.[47] Negotiations with Nippon Steel on the suspended contracts began in earnest in early May, with the Chinese requesting that the contract terms be changed from cash to deferred payments, and that the agreements covering the second blast furnace and coking oven battery, as well as various auxiliary facilities be renegotiated completely over a longer period of time. Nippon agreed with both requests, but when the new arrangement was finalized in mid-June, the Chinese had accepted the Nippon condition of 7.25 percent interest on contracts, which were now to be repaid over five years.[48] With the revival of the contracts, the last chance to stop Baoshan's construction was effectively lost.

C. INTERLUDE, JUNE 1979–JUNE 1980

1. *New contracts*

After June 1979, Baoshan seemed to be proceeding more smoothly. By October, part of the foundations for the major facilities were in place, and road, water supply, and drainage networks were nearly completed.[49]

Negotiations with companies for the remaining facilities were conducted at a steady, if not spectacular pace. A series of new contracts were signed from December 1979–June 1980, covering facilities for both Phases I and II (See Appendix A). Of these the most significant were for the complex's finishing mills. A consortium led by Mannesman-Demag of West Germany was awarded a contract for a 500,000 ton seamless pipe mill in December, breaking the Japanese monopoly. Then, in April, consortia led respectively by Mitsubishi Heavy Industries and Schloemann Siemag (West Germany) won the contracts for the four million ton hot strip mill and the 2.1 million ton cold strip mill, worth a total of about $850 million. Schloemann had been heavily involved in the Wuhan project as well. Its consortium included Wean United of Pittsburgh, which was responsible for a hefty 16% of the project. Wean's is the only significant US involvement with Baoshan, aside from technology licenses for coke oven byproduct recovery plants and reheating furnaces supplied by Japanese companies. As of June 1980, the only major outstanding facilities were the continuous caster, and the major items Nippon Steel was to supply for Phase II, including the second blast furnace and coking oven battery.[50]

For most of the facilities purchased after June 1979, the Chinese arranged to supply a significant proportion of the equipment from their own factories under the foreign companies' guidance. Although the most critical equipment was still to come from the foreign companies, the Chinese were to manufacture some motors and electrical equipment, among other items. In the case of the cold-rolling mill, the consortium valued the Chinese contribution at approximately $170 million, or 25% of the total.

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[47] Japan Economic Journal, May 15, 1979, p. 2.

[48] Japan External Trade Organization (JETRO) China Newsletter, July–August 1979, p. 16; Dori Jones, "When the Chinese Suspend Your Contract", China Business Review, vol. 6, no. 5, 1979, pp. 58–59; American Metal Market, June 15, 1979.

[49] Shanghai City Radio, Oct. 10, 1979, FBIS Oct. 19, 1979, pp. O4–5.

[50] See Dori Jones, "The Baoshan Contracts", China Business Review, vol. 7, no. 4, 1980, pp. 47–49.

In response to Chinese pressure, Nippon Steel reportedly agreed in principle that 25 percent of the Phase II blast furnace and coking ovens be supplied by Chinese factories. No concrete arrangement, however, could be reached in the first half of 1980. Nippon reportedly believed that the Chinese were trying to take on more than they were technically capable of doing.[51]

2. *Construction Coordination Difficulties*

The difficulties in concluding Phase II contracts were only one indication that beneath the surface, all was not well at Baoshan. Other difficulties stemmed from a construction planning and management system that invited confusion and chaos.

As with other major projects in China, there were a welter of bureaucracies involved at Baoshan under the nominal leadership of the State Capital Construction Commission (SCCC),[51a] which was charged with ordering the national construction plan. Central ministries involved included Metallurgical Industry (MMI), First Machine Building (responsible for Chinese made equipment), Communications (responsible for Beilun port construction and for work on the Yangzi River designed to facilitate shipping to Baoshan), Foreign Trade, Coal, probably Electric Power, as well as the State Planning Commission (SPC). Shanghai Municipal authorities were intimately involved, as were Provincial planning authorities in some neighboring provinces. Even the Shipbuilding Ministry had an indirect stake through its efforts to build a 100,000 ton ore freighter.

These organs are notorious for conflict and lack of communication with each other. The record of coordinating Commissions such as the SCCC and SPC is far from spotless in this regard. The Wuhan steel rolling mill experience highlights what has been a far from infrequent failure to coordinate auxiliary facilities, infrastructure, and material inputs with major construction projects in recent years under the system of divided responsibility.

The fact that Baoshan included an imported power plant meant that its planners were trying to avoid at least one of the mistakes at Wuhan. Indeed, a "deputy commander in chief" of Baoshan boasted that, in contrast to Wuhan, Baoshan was carrying out "synchronized construction."[52]

Other evidence, however, suggests differently. A June 1980 report on the second "coordination meeting" involving all the bureaucratic units concerned stated that "Since the conclusion of the first coordination meeting, remarkable results have been made in speeding up construction of both major and supplementary projects".[53] This carried the strong suggestion that prior to the first meeting, results had been less than remarkable.

One obvious potential problem was coal supply. Baoshan, according to the original plan, probably would require something on the order of 6.5 million tons of coal per year at minimum: 4.5 million tons for the coking ovens and 2 million for the power plant, a total of about 1 percent of China's 1981 coal output. If lower quality coking coal were used, the requirement could be significantly higher. China decided early on to supply all of the coal, despite possible technical problems, for obvious political reasons.[54] Given the recent stagnation in coal production, and the relatively slow rate at which new capacity is likely to be added in the immediate future, this would be a far from simple matter. Yet, as recently as mid-1981, according to information received by the National Council for U.S.-China Trade, there was still some uncertainty as to where the coal would come from. Geographically, the most convenient coking coal source would be the Huainan mines in Anhui, about 450 kilometers from Shanghai by train and boat. But it seemed likely that for quality reasons some would originate in distant Shanxi Province. This at any rate was the Japanese recommendation. Quite aside from the issue of mining this coal, transporting it on China's overloaded railroad system would pose difficulties.

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[51] "China Postpones Second Phase of Baoshan Project", JETRO China Newsletter, December 1980, p. 3; Asian Wall Street Journal, Jan. 30, 1980.

[51a] Early 1982 reports suggested that the SCCC would be abolished.

[52] NCNA in Chinese, Apr. 22, 1980, FBIS Apr. 25, 1980, p. O4.

[53] Shanghai City Radio, June 15, 1980, FBIS June 16, 1980, p. L5.

At the main construction site itself, work was led by a "command post" whose head was a Vice-Minister of MMI, and whose deputy head was a Vice-Mayor of Shanghai. By some accounts, relations between Shanghai and MMI were far from smooth. One high-level Japanese visitor, for example, noted in 1980 that MMI was concealing information about pollution from city officials.[55]

Relations between Japanese instructors and advisors and the Chinese were apparently not always smooth either. Japanese engineers reportedly complained that their Chinese counterparts were denying them site data.[56]

Such coordination problems, in addition to the contract suspension, had already caused construction delays by 1980. Nippon Steel indicated in January that Phase I was likely to be commissioned in August 1982, about one year behind the original schedule.[57]

Of greater political significance was the issue of cost. Given the fragmented responsibility system outlined above, it is hardly surprising that it was difficult to put together a single figure for the total price of the project. As early as mid-1979, MMI and the Ministry of Finance were presenting different estimates and MMI was later to be accused of not including many of the auxiliary projects in its estimate of ¥21.7 billion ($14.5 billion at 1980 exchange rates; it is virtually impossible to tell how much of the figure is foreign exchange costs, or what conversion factor the Chinese used. It seems reasonable to assume that the domestic costs were figured at 2–3 times the foreign exchange costs.) [58] To Chinese critics, it seemed that tremendous sums were being spent—amounting to ¥1.48 billion per quarter, according to one report [59]—on a project for which the end was nowhere in sight.

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[54] Lewis, Bonavia, and Rowley, Far Eastern Economic Review, loc. cit., p. 57.

[55] Ibid., p. 50.

[56] Ibid.

[57] Kyodo News Service in English, Jan. 10, 1980, JPRS 75003, Jan. 23, 1980, p. 19.

[58] Speech of Deputy Qian Zhongtai to 3d session of Fifth National People's Congress, reported by People's Daily, Sept. 7, 1980, p. 2, FBIS Sept. 15, 1980, p. L8; Beijing Review Sept. 29, 1980, p. 35.

[59] Shanghai Municipal Radio in Chinese, June 15, 1980, FBIS June 16, 1980, p. L5.

D. READJUSTMENT PHASE II: CONSTRUCTION HALTED AND PHASE II PROVISIONALLY CANCELLED, JUNE 1980–JANUARY 1981

By June 1980, the pressure against Baoshan was mounting again. On the economic front, planners like Chen Yun were grappling with the difficulties of making readjustment take hold. After 1½ years of effort, the scale of construction, far from contracting, had actually risen and the single most expensive project was Baoshan, in an industry that was supposedly low priority. Moreover, a recent series of meetings had revealed yet another MMI cost underestimation for the plant.[60] The failure to control construction had led to the country's largest budget deficit ever in 1979, and was on its way to creating a new large deficit in 1980; the inflationary implications were particularly alarming to men like Chen, whose first action upon assuming power in 1949 had been to bring runaway inflation under control. Primary energy production was declining, and showed little prospect of picking up significantly in the immediate future and Baoshan, on top of its other problems, would be an enormous energy consumer.

Politically, the dismissal from the Politburo in February 1980 of the "Little Gang of Four" sympathetic to Hua Guofeng (i.e. Chen Xilian, Wu De, Ji Dengkui, and Wang Dongxing), and the creation of a new secretariat to run the Party's daily affairs had weakened the influence of the heavy industrial interests. By the end of June, well-connected Hong Kong sources were predicting the imminent downfall of the "petroleum clique", which was soon brought to pass with the publicity given to the negligent destruction of an offshore oil rig. Planning Commission Chairman Yu Qiuli was losing real power, and was to step down from his position at the end of August.[61]

In June, a series of strongly worded editorials stressing the need to undertake construction in line with capabilities, and with the ability to provide auxiliary facilities began to appear in the press.[62] Viewed in this light, the failure to reach agreement with Nippon Steel for Phase II signified something deeper than a dispute over the percentage of Chinese equipment.

Baoshan's foes were by now strong enough to begin gradually to go public. Their first salvo was Vice-Premier Bo Yibo's comment in early July to Japanese visitors that Baoshan was becoming a "burden".[63] The pressure was raised several notches on August 1 when the Chinese press finally lifted the lid from the fiasco of the imported Wuhan rolling mill. The People's Daily commentary emphasized the failure to coordinate auxiliary projects for electricity and raw material input, and the difficulties the mill personnel had experienced in operating such advanced technology. It questioned whether such an advanced steel mill was appropriate for a poor country like China. It also stressed the need to avoid repeating the mistake:

> Of course, we must . . . pay a price or . . . certain "tuition fees" to learn a job . . . It is absolutely impermissible to keep on paying "tuition fees" without

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[60] Speech at 3d session, Fifth National People's Congress (NPC) of Deputy Yuan Xuefen, People's Daily, Sept. 12, 1980, p. 4, FBIS Sept. 19, 1980, p. L19.
[61] Lo Bing, Cheng Ming, July 1, 1980, loc. cit.
[62] People's Daily June 9, 1980, FBIS June 12, 1980, p. L17; People's Daily June 16, 1980, FBIS June 20, 1980, p. L3.
[63] Kyodo News Agency in English, July 24, 1980, FBIS, July 24, 1980, p. L1.

> making any improvement. Not only we, but also great entrepreneurs and financial groups in advanced countries cannot afford to pay such high tuition fees as the rolling mill.[64]

To any aware Chinese, the connection of the statement about "keep on paying tuition fees" with Baoshan must have been unmistakable.

Finally, at the National People's Congress (NPC) session in September 1980, the long simmering controversy exploded into the open, as politically powerful deputies blasted MMI officials with criticisms and questions, which appeared in the media day after day. The familiar problems with the plant's location and geology were cited. A number of objections were raised on environmental grounds, namely that the plant was located upwind from Shanghai proper two seasons of the year, that there were no plans for solid waste disposal, and that it was not known how much carcinogenic substance would be released by the plant.[65]

Imported iron ore was another target. Deputies charged that the production cost of pig iron would be twice as high at Baoshan as at other mills using domestic ores. Another speech illustrated how strongly this issue aroused latent sentiments about self-reliance:

> Have we signed a long-term contract with foreign countries concerning the supply of ores? If they raise ore prices extensively or stop supplying them, what countermeasures should we adopt? Our large enterprises should not be controlled by foreigners.[66]

To this, MMI replied that it was "studying" the possibility of substituting domestic for foreign ores.

The project's overall economic feasibility was challenged. One deputy asserted: "Many people worry about the possibility that Baoshan will become a bottomless pit that can never be filled."[67] Another questioned MMI's assertion that Baoshan would make a profit of ¥1.63 billion per year, and thus pay off its investment in 13 years.[68] The old debate about foreign loans and interest rates was resurrected: "We prefer to base the interest rate on the US dollar, whereas Japan insists on the yen. What is the result of the talks?"[69] Charges were raised that interest had not been included in the cost estimates, and that annual profits from the project would not even be sufficient to repay the interest.[70]

One of the remarkable features of the barrage of criticisms was the anti-Japanese feeling expressed:

> Japanese economic and industrial circles have reportedly talked a lot about the Baoshan project to the effect that China is too generous to Japan because China has renounced its claim to indemnities [from WW II] and that it is not right for Japan to cheat the Chinese people in the Baoshan project . . . How long is the insured service life of the facilities and equipment? If the service life of the equipment and facilities expires after we pay back all capital plus interest, we will have been duped by the Japanese.[71]

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[64] Meng Xiancheng, loc. cit. and People's Daily commentator's article, Aug. 1, 1980, FBIS, Aug. 15, 1980, p. L11.

[65] Speeches reported in People's Daily, Sept. 12, 1980, FBIS, Sept. 19, 1980, p. L19.

[66] Beijing Deputy Wang Huide, reported by People's Daily, Sept. 7, 1980, p. 2, FBIS Sept. 15, 1980, p. L8.

[67] Beijing Deputy Liu Da, reported by People's Daily Sept. 7, 1980, p. 2, FBIS Sept. 15, 1980, p. L8.

[68] Beijing Review Sept. 29, 1980, p. 35.

[69] Beijing Deputy Liu Da, loc. cit.

[70] Beijing Review Sept. 29, 1980, p. 35.

[71] Beijing Deputy Wang Huide, loc. cit.

In this climate, interests threatened in any way by Baoshan felt free to attack. For example, newspapers printed a letter from a domestic drill-rod coupler factory, claiming that it would be put out of business by the Baoshan seamless pipe mill, and that it was perfectly capable of supplying the couplers at a cheaper cost.[72]

Many of these specific arguments raised against Baoshan were not particularly convincing or sound. The drill-rod factory, for example, neglected the probable quality differential between its products and those of a Mannesman-Demag pipe mill. It seems ludicrous to suggest that the Japanese were intentionally trying to dupe the Chinese by selling equipment whose useful life would expire by the time the loans were paid back—the payback period is a function of factors on the Chinese side. The worst the Japanese—who played no role in the feasibility planning of Baoshan—could be accused of is, for short term commercial interest, going along with Chinese plans that they should have known would be unrealistic. The argument about the cost of interest payments seemed to either calculate interest against the total, rather than the foreign exchange costs, or use an absurdly high value of the dollar vs. the Chinese yuan. The alarm about the iron ore certainly appeared overstated in light of recent trends in the world iron ore market; Australia was very eager to win Baoshan contracts.[73] The argument over the cost of pig iron neglected the possibility that the overall costs of the end product, steel, might be lower than in other Chinese plants due to the advanced technology, and the fact that Chinese ore prices are probably maintained at artificially low levels vis-a-vis imported ore prices by the fiat of administrative price controls. The pollution argument seemed to have somewhat more validity, but the Deputy who presented it chose to make light of the fact that advanced Japanese air and water treatment systems were included in the design. Baoshan probably had much better pollution control plans than many other plants in China that have been the subject of much less criticism.

The whole of the argument—that Baoshan was fundamentally infeasible for a number of reasons—probably had a great deal more validity than the sum of the above parts. It was the political vigor, rather than the intellectual rigor, of the arguments that was most important anyway. Chen Yun and his followers appear to have decided long before that the entire project was a mistake, and that to continue with Phase II would be to throw good money after bad. Their purpose at the NPC was to politically undermine "some people . . . still demanding that the project be extended."[74] That they had succeeded was clear when the Japanese were formally notified in November that Phase II would be postponed indefinitely.[75]

There were still further bombshells to come. In a series of November Politburo meetings, and at the December work conference which followed, Chen decisively faced down his foes on economic policy, and emerged with a mandate to take draconian measures to reestablish central fiscal controls, eliminate budget deficits, fight inflation, reduce construction expenditures, and reorient priorities towards raising living standards and reestablishing sectoral balance. Readjustment was finally implemented in the manner he had desired for two years, as the 1981 capital construction budget target was reduced from ¥55 billion (approximately the level of 1980 expenditures) to ¥30 billion. The planned allocations in domestic currency for Baoshan in 1981 were slashed substantially in this move, bringing construction activity at the site to a near standstill.

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[72] Letter to Guide to World Economy, reported by Shanghai Municipal Radio Oct. 14, 1980, SWB Oct. 29, 1980, p. A5.

[73] See Tony Walker, "China Reviewing Iron Ore Orders," Sydney Morning Herald Mar. 2, 1981.

[74] Unspecified Deputy's statement at 3d session of NPC, reported in People's Daily, Sept. 12, 1980, p. 4, FBIS Sept. 19, 1980, L21.

[75] JETRO China Newsletter, December 1980, p. 3.

Chen's full purpose finally became clear when Nippon Steel was informed that Phase II was not simply to be postponed, but to be terminated. In late January, companies holding the hot and cold strip mill contracts, and the contracts for several of the auxiliary facilities for Phase II, whose combined value was close to $1 billion, were told that China did not intend to construct the facilities, and that they should stop all work and prepare to discuss resolution of the contracts with CNTIC[76] (see Appendix A). A similar request was sent to companies involved in most of the petrochemical projects launched in 1978.

E. IN SEARCH OF RESOLUTION, 1981, AND BEYOND

The Baoshan situation has been extraordinarily chaotic since early 1981, as the Chinese have gained fuller awareness of the practical consequences of their precipitous move to truncate and delay its development. A series of sometimes contradictory initiatives have been proposed in an attempt to partially salvage a situation that seems to offer no palatable choices.

The issue of contract resolution has been the main catalyst. The foreign company reaction to the stop work orders—which some interpreted as unilateral cancellation—was one of outrage. The abrupt unilateral style of Beijing's actions rankled almost as much as their content; there was no explanation of the move, and no prior consultation on how to resolve the contracts. In Japan, the uproar reached the point where there was speculation that China might lose its eligibility for certain types of government financing, as China was giving no clear signals regarding what kind of compensation it might offer for costs the companies had already incurred.[77]

Companies that were already beginning to ship equipment demanded virtually full payment for the entire value of the equipment contracted for, as manufacturing arrangements with subcontractors were so far advanced as to be unstoppable. Beijing soon decided to continue accepting shipments for such plants, which were all in the petrochemical sector.[78]

The Baoshan contracts for which stop work orders were issued, on the other hand, were at an earlier stage of implementation. No shipments at all had been made for the hot and cold strip mills. Yet, Mitsubishi and Schloemann Siemag demanded that the Chinese pay 33 percent of the contract in the event of cancellation, to cover equipment ordered, pre-contract costs, lost opportunity costs, etc, or a total of about $300 million in foreign exchange for equipment that the Chinese would never touch.[79]

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[76] JETRO China Newsletter no. 30. February 1981. p. 10.

[77] John Lewis and David Bonavia, "The Honeymoon Is Over," Far Eastern Economic Review, Feb. 20, 1981, pp. 46–47.

[78] See Martin Weil, "The 2.6 Billion Contract Freeze," China Business Review volume 8, no. 3, 1981, pp. 31–33.

The vehemence of the international reaction to the stop-work notices, together with the size of the compensation demands, clearly shocked China's political leaders. This seems the best explanation for the sudden gyration begun with Deng Xiaoping's suggestion in February 1981 to a Japanese government fact-finder to consider revival of the suspended projects with cheap Japanese government loans. In April, China made a formal government-to-government request for the equivalent of approximately $2.7 billion in loans for all the suspended projects, of which approximately $800 million was targeted for Baoshan.[80]

The request apparently hit some of Deng's compatriots, as well as the Japanese, like a bolt from thhe blue, and it aroused political opposition. An April People's Daily article reflecting Chen's views pointedly noted that:

> We absolutely cannot do as some comrades advocate: when money, equipment, and materials are not available domestically, then borrow from abroad, buy from abroad, and stretch our hands abroad.[81]

To many in Japan, the request for cheap loans seemed outrageous as well: "robbing Peter to pay Peter", as one businessman is reported to have put it. The Japanese government, furthermore, was faced with its own fiscal constraints, and the danger of alienating other aid recipients by appearing overly generous to China.[82]

In the end, however, the forces within both governments in favor of smoothing over the controversy prevailed. After approximately six months of negotiations, a compromise was reached under which Japan will provide approximately half of the amount originally requested by China, or about 300 billion yen ($1.3 billion), at an average interest rate of about six percent, higher than what the Chinese originally hoped for, but still a bargain.[83] Vice-Premier Gu Mu formally signed the agreement during a December 1981 visit to Japan.

Probably about half of the money will go towards completion of Phase I of Baoshan. It will not, however, be used directly to buy materials for the steel project. Rather, it will be put into central foreign exchange coffers, and the equivalent in Chinese domestic currency will go to Baoshan. This underlines the fact that the loans are not really needed to ease a foreign exchange crisis. Rather, they must be considered part of an elaborate political compromise with Baoshan's fiscally conservative opponents. The government is reportedly planning to use the foreign exchange to buy consumer goods from abroad, which it will then sell in China to retire domestic currency.[84]

With the loans in place, it is generally believed that construction of Phase I, with three million tons of capacity, will be completed in 1984–1985. The possibility of continued political infighting, however, combined with potential difficulties in coordinating auxiliary projects and energy supply lends uncertainty to any prediction.

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[79] Japan Economic Journal, Mar. 31, 1981, p. 3 and June 2, 1981, p. 7.

[80] Japan Economic Journal, Apr. 28, 1981, p. 3.

[81] Contributing Commentator, "Straighten Out Guidelines for Economic Work—On Leftist Mistakes in Economic Construction", People's Daily, Apr. 9, 1981, p. 5, FBIS Apr. 16, 1981, p. K3.

[82] Bonavia and Lewis, loc. cit.

[83] Japan Economic Journal, Sept. 15, 1981, p. 1.

[84] Wall Street Journal, Sept. 8, 1981, p. 38.

When Phase I is finished, all of the crude steel except for the approximately half million tons to be made into pipes at Baoshan will have to be shipped to other mills for finishing. There are other reasons as well why building Phase I without Phase II is unattractive, including the need to construct many of the auxiliary facilities to scale regardless, and the need to shut down the entire complex when overhauling a single blast furnace.

Thus, the rash decision to cancel Phase II was reconsidered. In early 1982, the Chinese were negotiating an unprecedented arrangement with the Schloemann Siemag consortium to keep the cold rolling mill contract in effect, but to delay equipment deliveries and plant construction for five years.

Mitsubishi and the other Japanese companies whose Phase II contracts had been suspended, however, refused to accede to such an unorthodox formula, and in August 1981 reached agreement with the Chinese to cancel the contracts. The compensation will only amount to $45 million, about 10 percent of the contracts' value, and a mere one-third of what Mitsubishi originally requested. In its public announcement of this agreement, the official New China News Agency noted that, "According to the agreement, if China resumes construction of the rolling mill and imports complete technology and equipment or a key part of the equipment, the Mitsubishi group will be given priority if it offers equipment and technology of the same quality and at the same price as other companies." [85] This led many observers to believe that the Chinese had reached a private understanding with Mitsubishi to revive the contract at a later date.

The Chinese statement, which also indicated that Phase I would be continued and Phase II "postponed," contained the first positive public reference to the plant in more than a year. It came at a time when Baoshan's supporters were starting to stir again politically, in response to some of the negative side-effects of Chen Yun's readjustment policy, such as stagnation in industrial output. Vice-Premier Gu Mu felt bold enough at this time to hint to the Japanese media that Phase II would definitely be revived at some point.[86]

Given the jolts to which Baoshan has been subjected so far, it would be rash indeed to believe that the final word has been said about Phase II. The events of 1981, however, suggest that the difficulties of stopping the project in midstream will eventually induce the leadership to complete it. No alternatives are attractive, and it seems safe to predict that Baoshan will be a millstone around planners' necks for a long period to come.

IV. CHANGING FEATURES OF THE IRON AND STEEL INDUSTRY

Baoshan was predicated on plans for a rapidly expanding steel industry. Quite aside from all the political mudslinging and infighting, its difficulties have much to do with the fact that there is little prospect for significant growth in the industry in the immediate future, due to the combined impact of policy changes and general economic difficulties.

Planners have held the steel target at 32–33 million tons, 1979–1981, just .6–3.8 percent greater than 1978 output. In 1979 and 1980, actual output increased by an average of 8.2 percent, according to Chinese statistics, but production began to drop in the fourth quarter of 1980 when the readjustment policy was intensified. Production in 1981 was 35.6 million tons, a 5 percent drop compared to 1980.[87]

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[85] China Daily, Beijing, in English, Sept. 24, 1981.
[86] Asian Wall Street Journal, Oct. 3, 1981, p. 1.

This drop in production corresponded with a drop in demand, as the move to reallocate priorities from heavy to light industry resulted in some radical shifts in the structure of industrial output. Production in the major machine building industries, such as machine tools, motor vehicles, tractors, freight wagons, locomotives, internal combustion engines, and power generating equipment declined markedly in 1980. In some cases, such as mining equipment, tractors, and freight wagons, the declines were over 30 percent. Although output figures of military hardware industries, another important steel consumer, have not been published, the reports about the increasing percentage of civilian good output of military factories (11.5 percent in 1979 compared to an anticipated 47.5 percent in 1981 [88]) suggest that armaments production has declined in a similarly drastic way.

Light industrial production, on the other hand, has been soaring, particularly in consumer durables; output for bicycles, sewing machines, television and radio sets rose by over 25 percent in 1980 and 1981 (considerably more in the case of radios and TVs).[89] While this growth is creating some new demand for steel, the fact remains that these industries are not "metal eaters" on a par with the heavy machinery industries.

The decline in demand for steel is also dramatically reflected in steel product imports, which dropped from over eight million tons in each of the years 1978 and 1979 to about three million tons in 1980, according to Chinese reports. Reports on imports from Japan, China's largest supplier, suggest that 1981 purchases were no higher, and may be lower.[90] This decline in itself eliminates one of the major elements in the rationale for building Baoshan.

Much of the decrease in heavy machinery production probably represents output that would have had no economic value anyhow; China's machine building industries have been notorious for blindly mass-producing items for which no market can be found (for reasons including low quality, lack of variety, high price, and market saturation), simply in order to meet output targets. Overstocks of mechanical and electrical equipment were estimated, probably conservatively, at ¥100-200 million in early 1981 ($37-75 million at mid-1981 exchange rates). The same pattern held for the iron and steel industry, for which overstocks were estimated at three million tons of products.[91] Special efforts were being made in 1981 to turn over some of the accumulated stocks. The attention authorities are attaching to the problem is another factor behind the slowdown in steel production.

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[87] Annual output statistics cited here and below are taken from annual communiques published by the State Statistical Bureau. Qaurterly and monthly statistics have recently been published in the Hong Kong publications China Economic News and Economic Reporter, which seem to have access to the State Statistical Bureau figures. For total year 1980, the figures appeared in Economic Reporter, February 1981, pp. 26–27. First quarter 1981 numbers appeared in China Economic News, Apr. 27, 1981, pp. 7–8.

[88] NCAA. Apr. 23, 1981, SWB May 6, 1981, pp. A8–9.

[89] See footnote 87

[90] Journal of Commerce, New York, June 20, 1981, p. 1B.

[91] NCNA in Chinese, Feb. 15, 1981, FBIS Feb. 18, 1981, pp. L16–17.

Energy supply is another important consideration. The metallurgical industry was estimated to have consumed about 20 percent of China's electric power in 1979, of which the vast majority was for steel. Steel also consumes an enormous percentage of China's coal. The need to conserve energy, and guarantee coal and electricity supply for other industries was an explicitly stated reason for the low steel targets, 1979–1981. The bleak state of China's energy industries would put limits on steel output even if steel remained the "key link" (see Robert Michael Field and Judith Flynn, *China: An Energy-Constrained Model of Industrial Performance Through 1985*, this volume).

Machinery production began a comeback in late 1981, but current policies suggest that increases in the near future will still be modest, rather than spectacular. Thus, there will probably only be moderate demand pull on steel.

In 1981, it appeared that all activity on major additions to steel capacity had stopped. Construction of a large new blast furnace at Maanshan, Anhui plant, for example, was cut off in midstream.[92] Existing capacity was closed down, in some places.[93]

Current emphasis in the steel industry is on increasing the output of materials in short supply that can be used in light industry such as welded tubes, small shapes, and sheets, and on increasing the efficiency of the steel industry. The ratio of finished to crude steel output, for example, rose from 69.5 percent in 1978 to 74.7 percent in 1981. The ratio of pig iron to crude steel output fell from 1.095 to .955, as the country turned to the energy-saving alternative of using more scrap (in many Western countries, the ratio is as low as .7). One consequence is that some Chinese factories are now exporting pig iron. In the late 1970's, on the other hand, China was a big importer. Another major preoccupation of the steel industry is getting more value out of the imported Wuhan finishing mills.

When China does decide to add new capacity, the emphasis, barring another major policy reversal, will almost certainly be on upgrading and expanding old mills, rather than constructing new ones such as Baoshan. Basic oxygen furnaces will replace less productive and obsolete open hearth furnaces, old blast furnaces will be remodelled, etc.

An example from 1980 illustrates the type of role foreign technology might play in this process. An agreement was reached with Mannesman-Demag, supplier of the Wuhan continuous caster, for assistance in the construction of seven continuous billet casters for various existing mills. The company will supply the first machine, but under a technology license agreement, will assist Chinese factories in gradually manufacturing larger and larger proportions of the succeeding six; by the seventh, hopefully, China will be able to manufacture the entire machine on its own.[94] The technology of the billet casters, furthermore, is significantly less complex than that of slab casters purchased for Wuhan, and originally planned for Baoshan.

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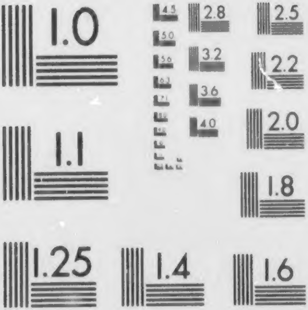
[92] NCNA in Chinese Nov. 28, 1980, FBIS, Dec. 2, 1980, pp. O1–O2.

[93] Hubei Provincial Radio, FBIS, Feb. 17, 1981, p. P5.

[94] See Martin Weil, "Technology Transfers", China Business Review, volume 8, no. 2, 1981, pp. 22, 26.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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS
STANDARD REFERENCE MATERIAL 1010a
(ANSI and ISO TEST CHART No. 2)

Several steel experts feel that China's chances of absorbing the less sophisticated technology are significantly greater. The licensing formula is obviously also geared to absorption. There are certain drawbacks in such an agreement; delivery time, undoubtedly will be greater than if Mannesmann simply supplied all the machines on its own. Whether or not licensing is more successful than buying a complete plant from an economic point of view, it is obviously more acceptable to politicians with strong self-reliant, nationalistic sentiments. The contrast with Baoshan is striking.

V. CONCLUSION: BAOSHAN IN PERSPECTIVE

Was Baoshan an infeasible project from the start, as top Chinese leaders now believe? This is difficult, if not impossible to determine, as so much of the opposition to the plant has been political, and so much has changed politically and economically since the project was conceived. Yet, the answer is probably affirmative, and the main reasons lie in its size and sophistication. The experience of the recent past suggests that when the Chinese have attempted to buy the world's most sophisticated technology, they have often proven unable to absorb it effectively, due to managerial problems, technician inexperience, lack of certain material inputs, etc., as with the Wuhan rolling mill. On large sophisticated projects, furthermore, there have been striking failures to coordinate all the necessary auxiliary facilities, and Baoshan would probably not have been an exception. The current shortages of primary energy in China, for example, practically guarantee that energy supply would have been a major problem if the plant had continued according to schedule.

Some of the other objections raised, such as siting and pollution seem more dubious as grounds for declaring Baoshan an infeasible project. These issues certainly posed some problems, but not ones that could not be surmounted. They appear to have been blown out of proportion in the heat of political battle.

Even if the project by itself were feasible, the four modernizations plan, of which it was a part, most certainly was not. That such a plan, and such a project, were launched so hastily illustrates the enormous economic power that has tended to be concentrated in the hands of high-level politicians who are anxious for glory, but lack sophisticated technical or economic knowledge, and who are not held economically responsible for failure. That this problem may have roots in Chinese history is suggested by the story of China's first modern iron and steel plant, which was built and run in Wuhan by Governor-General Zhang Zhidong (Chang Chih-tung) in the 1890's. It suffered from all kinds of planning problems, including ore and coal supply, could not operate at capacity, and ran at a loss for 13 years before Zhang turned it over to private operators.[95] That the problem may have roots in command economy planning structures is suggested by the Katowice

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[95] For an acerbic modern Chinese commentary on this plant, see Yan Zhongyi, "On the Economic Effects of Zang Zhidong's Activities in the Westernization Movement", Jingji Yanjiu (Economic Research), Beijing in Chinese, May 20, 1981, pp. 74–79, FBIS July 8, 1981, pp. K7–14.

Steel Mill built in Poland in the 1970's which according to one report cost $2.5 billion to build, but cannot be operated at a profit.[96]

The way in which Baoshan was suddenly halted in midstream seems to illustrate this problem from a different angle. In this case, politicians pursuing very different economic goals from Baoshan's planners took a similarly precipitous action, also without adequate understanding of the consequences, as shown by the chaotic negotiations of 1981. Baoshan is an unseemly symbol of the disruptive economic gyrations that have tended to follow political infighting in the PRC.

Baoshan, however, is more than just an illustration of planning problems. Its rise and fall are symbolic of what could be an historic shift in China's industrial development strategy. The plant was begun in the Stalinist/Maoist spirit of rapid growth, high investment, and steel and machine building as the main priorities. The attack on Baoshan is representative of the attack not just on the four modernizations plan, but on China's entire history of Stalinist/Maoist development. A different strategy has been formulated: slower but more balanced growth, lower but more efficient investment, greater attention to efficiency, shift in priorities away from steel towards infrastructure and towards consumer industries. Recent trends in the steel industry demonstrate Baoshan has been part of a much larger change in China's industrial economy.

Baoshan also points to a major change in China's strategy for utilizing foreign technological expertise. Rather than import complete plants and invite foreign companies to take charge of design and construction supervision, the country now intends to focus on purchasing key items of equipment, and on buying know-how. The arrangement on many of the later Baoshan contracts, under which Chinese factories are to manufacture a significant proportion of the equipment, seems likely to be the standard for engineering projects involving foreign companies in the future.

Actually, this shift in technology acquisition strategy represents in many ways a return to old values of self-reliance. In reviewing Baoshan's history, it is difficult to avoid the conclusion that the depth of foreign involvement was a major cause of the difficulties the project encountered from the beginning. Imported iron ore, foreign loans, and the extent to which the Japanese controlled the project were all lightning rods for nationalistic resentment, which expressed itself in accusations that often seemed irrational on economic grounds. The entire Baoshan experience suggests that there are limits in post-Mao China, just as there were in Mao's China, beyond which foreign involvement in economic development will not be politically acceptable.

In the final analysis, Baoshan has been an expensive failure. But at the same time, it signifies many potentially positive changes. The plant has driven home the need for thorough feasibility studies for major projects. It has contributed to the Chinese understanding that there is more to modernization than buying advanced technology. Finally, Baoshan's history suggests that China, to an extent without precedent in Stalinist command economies, may succeed in overriding the influence of the bureaucratic heavy industrial interests that have done so much to distort development patterns in Socialist countries.

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[96] See Michael Dobbs, "Polish Steel Mill: Economic Fantasy," Washington Post, June 23, 1981, p. 1. His report suggests that the mill is being cut off in the middle of construction in a manner somewhat similar to Baoshan.

APPENDIX

THE BAOSHAN CONTRACTS

Company	Facility	Date of Contract	Value* (millions)	Repayment terms†	Status
Nippon Steel/C. Itoh	Blast furnace, 4,000 m^3	Dec. 23, 1978, payment terms revised June 1979.	$143	10 percent downpayment, 10 percent on delivery, 80 percent 5 yr deferred payment.	Implemented.
Nippon Steel/Mitsui & Co.	Coking oven, includes byproduct recovery facilities.	do	252	do	Do.
Do	Iron foundry	do	169	do	Do.
Do	Steel mill; basic oxygen furnace shop, 3 x 300 ton/heat.	do	215	do	Do.
Nippon Steel/Nissholwai	Blooming mill, 1,500,000 tons per year	do	243	do	Do.
Nippon Steel/Itoman & Co.	Quaywall factory	do	21	do	May be modified.
Mitsubishi Heavy Industries	Coal-fired power generating equipment, 700 MW.	Nov. 9, 1978	191	Not available	Implemented.
Mannesman-Demag	Seamless pipe mill, 21 to 140 mm diameter, 500,000 ton per year.	December 1979	‡182	5 yr period	Do.
Nippon Steel/Mitsui & Co.	Power piping facility	Dec. 30, 1979	41	10 percent downpayment, 10 percent on delivery, 80 percent 5 yr deferred payment.	Do.
Do.**	Raw material processing facility for blast furnace No. 2.	do	12	do	Canceled, 1981; compensation about 10 percent.
Nippon Steel/Marubeni	Power distribution and communications	do	76	Not available	Implemented.
Nippon Steel/Choyo Trading/C. Itoh	Water supply and exhaust	do	51	do	May be modified if phase II canceled.
Nippon Steel/Nichimen	Mold manufacturing factory	do	10	do	Do.
Nippon Steel/Nihatsu Shoji	Testing and analytic facilities	do	33	do	Do.

Mitsui	Auxiliary equipment for blast furnace No. 1.	Feb. 11, 1980	22	do	Implemented.
Kobe Steel/C. Itoh/Chikuma Sangyo	Oxygen Generating Units, 2 x 26,000 m³/hr.	Feb. 9, 1980	23	do	Do.
Mitsui**	Auxiliary equipment for blast furnace No. 2.	Mar. 26, 1980	12	do	Canceled 1981 compensation about 10 percent.
Kobe Steel/C. Itoh/Chikuma Sangyo**	Oxygen generating units 2 x 26,000 m³/hr.	Mar. 28, 1980	19	do	Do.
Mitsubishi Heavy Industries	Lime and dolomite kiln	Feb. 11, 1980	18	do	Implemented.
Mitsubishi	Additional power facilities	Apr. 3, 1980	36	do	Do.
Schloemann Siemag led 17 company consortium, includes Wean United USA and Nippon Steel**	Cold strip mill, 2,100,000 ton per year; includes pickling lines, electrolytic and hot dip galvanizing lines, continuous annealing line, roll-forming line, 5 shearing lines, 3 slitting lines, painting line.	June 5, 1980	500	5 yr repayment after completion.	Work halted 1981; 5 yr delay in implementation considered.
Mitsubishi consortium **	Hot strip mill, 4,000,000 ton per year.	Apr. 30, 1980	398	10 percent down, 10 percent on shipment, 80 percent after 5 yrs.	Canceled September 9, 1981 with $40,700,000 compensation.
Mitsubishi	Repair factory and warehouse	do	70	5 yr deferred payment	May be revised if phase II canceled.
Hitachi Shipbuilding	Sintering plant	Feb. 12, 1980	77	do	Implemented.
Nippon Sharyo/Mitsui	On-site transportation facilities	June 10, 1980	65	Not available	May be revised if phase II canceled.
Ishikawajima-Harima**	Port-loading facilities	Feb. 9, 1980	26	do	Canceled, 1981; compensation
For Beilun Iron Ore Port					about 10 percent.
Hitachi/C. Itoh	Unloading equipment and conveyor belts.	Nov. 25, 1978	36	do	Implemented.

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*Virtually all contracts, excepting those signed before December 1978 are to be paid half in dollars and half in currency of manufacturing country; figures noted are dollar estimates at exchange rates of July 15, 1981.

†Most of the Japanese contracts for which information was not available probably have terms of 10 percent downpayment, 10 percent on delivery, and 80 percent deferred payments over 5 yrs. This seems to have been a standard formula.

‡DM $440,000,000.

**Contract for which stop-work order issued, 1981.

Note:

Total value of Baoshan contracts	$2,941,000,000
Total value of canceled contracts for which stop-work notices issued	467,000,000
Total value of contracts for which long-term suspension negotiated	500,000,000

Source: Various media and company reports.

RURAL INDUSTRIALIZATION IN THE PEOPLE'S REPUBLIC OF CHINA: LESSONS FROM THE CULTURAL REVOLUTION DECADE

By Christine Pui Wah Wong*

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I. INTRODUCTION

The choice of technology is a central problem in economic development. On the one hand, the ability to borrow advanced technologies from the West allows less developed countries to speed up their industrialization process by skipping the time-consuming intermediate steps of research and development. On the other hand, technologies developed in affluent industrial countries invariably have "inappropriate" characteristics which make their transplantation to poor, primarily agrarian economies problematical. Among the inappropriate characteristics are their low labor-absorptive capacity, their stringent resource and skill requirements, their high foreign exchange costs, etc. It is also feared that the very advanced nature of these technologies inhibits the process of learning-by-doing in the development of indigenous adaptive and innovative capabilities, so that dependence on technological borrowing is perpetuated.

While there is substantial agreement in the development literature about the inappropriateness of Western technology, there is much less consensus on whether and how more "appropriate" technologies can be found. A number of recent studies show that technical (engineering) efficiency often does not coincide with economic efficiency, especially where existing factor proportions differ substantially between the user country and the originator-country of the technology.[1] At the same time, it is widely believed that the range of technological choice is extremely limited, particularly for the process industries. For example, in a recent study, Richard Eckaus (1977) emphasized that even though the Intermediate Technology Group and similar organizations have claimed success in discovering new "appropriate" technologies. "Their examples appear to be clustered in a few agricultural activities and small manufacturing activities outside the major production processes of both sectors. In the absence of cost-benefit analyses for new intermediate technologies, it must be concluded that for the major processes in mineral transformation, power generation, and the metal and electrical industries—i.e., much of the stuff of modern life—village-level intermediate technologies remain unfulfilled goals."[2]

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In the context of this search for substitution possibilities in technological choice, the rural industrialization program of the People's Republic of China deserves close study. With over one million small-scale enterprises employing well over 20 million workers, the Chinese program is unparalleled not only in size, but also in innovativeness. Of special interest are the 600,000 enterprises in the "five small industries" of iron and steel, farm machinery, chemical fertilizers, cement and hydroelectricity. Using modified versions of technologies that were long ago obviated in the West, these small-scale, relatively labor-intensive plants constitute an important experiment in the use of intermediate technologies. At their peak, they produced major portions of output in these industries: in 1978, they accounted for almost all of the small and medium farm tools and machinery, over half of the chemical fertilizers (by weight), 65 percent of the cement, etc., that were supplied to the agricultural sector.

This paper examines the development of the "five small industries" (hereafter, FSIs) during the Cultural Revolution decade. Since 1978, the FSIs have come under heavy criticism, when it was reported that they ran up losses totalling some two billion yuan in 1978 alone, accounting for 53 percent of total losses sustained by all state-run industrial enterprises.[3] At the end of the Cultural Revolution (CR) decade, many rural industries are beset by a host of problems ranging from technical, managerial, to supply and marketing difficulties. In order to learn from the Cultural Revolution decade, to understand current reform proposals and to forecast their efficacy, we must attempt to sort out the different types of problems and pinpoint their respective causes.

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[1] For example, see Francis Stewart, "Technology and Underdevelopment" (London: Macmillan, 1975); L. J. White, "The Evidence on Appropriate Factor Proportions for Manufacturing in Less Developed Countries: a Survey," Economic Development and Cultural Change, October 1978; and publications by the Intermediate Technology Development Group.

[2] Richard Eckaus, "Appropriate Technologies for Developing Countries" (Washington, D.C.: National Academy of Sciences, 1977), p. 49.

[3] Hubei Institute of Finance and Economics Bulletin, No. 1, 1981, p. 48; and Sun Shanging, "On Economic Structure", in Jingji Kexue (Economic Science), Nov. 1, 1980, translated in JPRS China Report: Economic Affairs, No. 99, p. 38. I am indebted to Lee Travers for bringing my attention to the Hubei bulletin.

First we need to distinguish between problems generated within the rural industrial sector from those originating "upstream." Due to the pervasive shortage of fuel, motive power and raw material supplies, for example, over one-third of all state-owned industrial enterprises ran deficits in 1976, and recovery has been slow.[4] Disruption of enterprise management and the downgrading of technical expertise during the CR has had very adverse consequences for overall industrial performance, such that advanced standards set in the 1960s are yet to be regained in many industries.[5] The present problems of low technical level, poor management and persistent underutilization of capacity in the FSIs must be viewed in the context of this environment.

At the same time, some of the problems faced by the FSIs are specific to the development of small-scale, local industries. In the current retrenchment drive, many of the plant closures are in the iron and steel and farm machinery industries, where fairly sweeping reforms are being implemented because the choice of technique and plant scale have turned out to be inappropriate, resulting in technical difficulties, high production costs, and low quality products.

Other closures are due to locational irrationality, where plants are built in areas without needed resources. Built according to the principle of "three locals," local, small plants are to make use of local resources to produce for a local market. Violation of this principle results in high costs as well as an increased transport burden. For example, in Guangdong Province, the Hainan Daily reported that in spite of insufficient coal resources on the island, eight small fertilizer plants were built there under the slogan of regional self-reliance. Because coal had to be supplied from such places as Shanxi, Henan, and Guizhou, the long distance transport added 120 yuan per ton to its cost. In addition, frequent disruptions in these supplies kept the plants from regular production runs. As a result, they ran up losses of 600 yuan for every ton of ammonia produced.[6]

The problems of substantial and persistent underutilization of capacity is pervasive in the FSIs as a result of duplication of facilities in many localities. This is particularly serious in the farm machinery (FM) industry. For example, in Jiangsu's Jiading County, there are 27 FM plants equipped with a total of 2,300 machine tools. At one time these plants produced 19 types of FMs. Of these, 17 have been discontinued, and the capacity utilization rate in these plants is now less than one-half. It is explained that

> In the beginning (these FM plants) were set up to aid agriculture, and they produced quite a few small machines and implements. However, after the market for such FMs and implements had been saturated, it became more difficult to design and manufacture more complex FMs, and they were unprofitable. Consequently, the plants turned to do subcontracting work for large industries, arming themselves with machine tools that they can make, further expanding their machine-building capability.

However, due to the limited amount of subcontracting work from large industries, the fierce competition among local FM plants results in everyone "going hungry."[7]

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[4] JJGL, 1979 (6), p. 9. See end of article for identification of abbreviations.

[5] Shen Yi, "Oppose High Targets in National Economic Planning, Stress Readjustment of the Economy", JJYJ, 1979 (7), p. 6.

[6] Hainan Island Service, Apr. 21, 1979, in BBC W 1030/A/21.

[7] Wang Gengjin and Ju Rongji, "Whither Commune and Brigade Industries?" JJGL, 1979(3).

While it is often impossible to isolate problems and attribute them exclusively to a single cause, we can nevertheless discern two distinct categories of problems afflicting the rural industrialization program. One category is discussed under the heading of "technoeconomic" problems, which includes problems involving the viability of technologies used in the small-scale plants, choice of plant scale, and plant location vis-a-vis skill and resource supplies. The second is broadly termed "administrative", and it includes problems of policy, performance indicators, investment choice criteria, tautness of State plans, and coordination among decision-making units. These categories are discussed in parts II and III, respectively. Part IV looks at the future prospects and likely orientation of China's rural industries, and part I provides the introductory framework.

TERMINOLOGY

In the Western, English language literature on China, "rural industries" commonly refers to industrial enterprises run by rural people's communes and production brigades, as well as state-run industries at the subprovincial level.[8] As such, it has a broader coverage than "village industries," since it includes all enterprises in the local industrial sector, which is distinguished from the national sector in a number of respects: its focus lies in serving agriculture and the rural populace rather than serving heavy industries or national defense; it consists primarily of small-scale enterprises using intermediate or primitive technologies; and these enterprises serve small, local markets. The local industrial sector in fact constitutes a fairly independent system that operates alongside the modern, large-scale sector. It plays a complementary role to the latter—at the lower end of the technological spectrum, local industries provide products which supplement and progressively replace output from the large-scale, modern sector.

Unfortunately, "rural industries" has no exact counterpart in Chinese statistical reporting categories, which makes the counting process difficult and often confusing. Rather, there are a number of Chinese categories which provide overlapping coverage of such enterprises. For example, "local state-run industries" (*difang guoying gongye*) includes provincial as well as sub-provincial enterprises. After the successive decentralization of enterprises to local (particularly provincial) control since 1958, this category now includes many large-scale enterprises.

In 1979, there were over 340,000 "small-scale industrial enterprises" (*xiaoxing gongye qiye*), which produced over 50% of the gross value of industrial output.[9] Of this number, over 260,000 were "urban collective industries" (*chengshi jiti gongye.*)[10] However, it is unclear whether county towns are counted as "urban" in this category. In any case, this figure is far too small to be a comprehensive count of all urban and rural industries.

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[8] For examples, see Dwight Perkins, et. al., "Rural Small-Scale Industry in the People's Republic of China" (Berkeley: University of California Press, 1977); Carl Riskin, "Small Industry and the Chinese Model of Development," China Quarterly. June 1971; Jon Sigurdson, "Rural Industrialization in China" (Cambridge: Harvard University Press, 1977).

[9] Xie Shirong, "Discussions on Problems of Chinese Style Modernization," JJYJ 1980(1), p. 41.

[10] Urban collective industries are said to be three-fourths of the total number of industrial enterprises. Hong Yuanpeng, Weng Qiguan, "On Collectively-owned Industries in Urban Areas" JJYJ 1980(1), pp. 62–65.

There are two categories which together provide a comprehensive and overlapping count of rural industries, and these are "commune and brigade enterprises" (*shedui qiye*) and "five small industries" (*wuxiao gongye*). In 1979, there were reportedly nearly 1.5 million enterprises run by rural communes and brigades. Together, they produced a gross income of 48,080 million yuan, which was over 30% of the total income for the three-level rural collective economy of communes, brigades and teams, and employed some 28 million workers, nearly 10% of the rural labor force.[11] However, even though these enterprises are often called "industrial" in the Chinese press, they include also enterprises engaged in nonindustrial, subsidiary agricultural activities such as poultry and fish-raising, orchards, mulberry and tea plantations, etc. Without some idea of the proportional breakdown between industrial and subsidiary agricultural activities within this category, the figure of 1.5 million can be used (at best) only as a very high limit for the number of rural industries.

A Chinese pamphlet on agricultural mechanization gives the definition of "five small industries" as follows:

> The so-called five small industries refer to the locally-run industries such as small iron and steel, small coal mines, small cement, small chemical fertilizers, small machinery, etc. Depending on local conditions, resources and needs, some (localities) have even developed small hydroelectricity, small mining spots, etc., to make them the six small or seven small industries. They are all usually called five small industries out of habit.[12]

The term first came into use in 1966, when the first National Conference on Farm Mechanization called on localities to actively run their own small-scale industries to make use of local resources, to help provide the materials needed for the "four transformations"[12a] in agriculture. Over time, the term has evolved to refer generally to all small-scale, locally-run enterprises that produce goods related to agriculture. Even by the narrow definition of the six or seven heavy industries that directly serve agriculture, there were by 1978 over 600,000 enterprises in the "five small industries" (see Table 1). Since the bulk of these enterprises are run by communes and brigades, there is a good deal of overlap with the category of commune and brigade enterprises.

IMPORTANCE OF THE "FIVE SMALL INDUSTRIES"

With the overwhelming emphasis that was placed on heavy industries in the Cultural Revolution decade, reports on local industrial development tended to give scant coverage to the growth of light industries. Even for the model communes and counties visited by foreigners, detailed accounts of industrial development often dwelled only on the "five small industries." As a result, we have little knowledge of the aggregate number of light industrial enterprises in the countryside. A rough estimate based on data from a few model localities and our counts of "five small industries" and commune and brigade enterprises places the number of light industrial and handicraft enterprises in the range of 400,000–600,000.

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[11] Beijing Review (BJR) No. 5, Feb. 4, 1980, pp. 7–8; and Peking Home Service, Mar. 25, 1980, in BBC W 1077/A/1. Another source reported that commune and brigade industries employ over 10 million workers. JJYJ 1980(6), pp. 56–57.

[12] "Run the 'Five Small Industries' and Commune and Brigade Enterprises Well To Speed Up the Process of Agricultural Mechanization," in "Speed Up the Implementation of Agricultural Mechanization" (Speeches), Peking, People's Press, December 1978, pp. 76–77.

[12a] The four transformations (sihua) are irrigation, mechanization, chemical fertilizer application, and electrification.

While there are inevitable regional differences in their pattern of development, the bulk of the light industrial enterprises are very small, employing as few as one or two to several dozen workers. They work with simple technology and rudimentary machinery and equipment. With the exception of some traditional export handicraft and mineral extraction activities, they are oriented toward providing consumer goods and services to the rural populace and processing foodstuffs for shipment to urban centers. Typical products include milled rice, flour, oil and other processed food, cooking utensils, furniture, and some minor repair and maintenance services. Many of these enterprises have origins in the village crafts before 1949, and they are similar to small enterprises commonly found in rural communities of developing countries.

The "five small industries," on the other hand, introduce new products and production techniques into the countryside. The gradual technical transformation of agriculture has created growing demands for industrial inputs: water conservancy and farmland improvement projects generate an enormous appetite for building materials and earth-moving equipment. The expansion of irrigated area requires more waterpumps and motive power. The increased availability of water allows more intensive cultivation, which in turn generates demand for more fertilizers. The greater agricultural output then intensifies the pressure to mechanize some of the work tasks to alleviate labor shortages during critical periods of the agricultural cycle, etc. In the 1970s, local FSIs have supplied increasing shares of inputs such as cement, farm machinery and chemical fertilizers.

Because the production of these "heavy" industrial goods often requires more complex industrial techniques and skills than do traditional or typical light industrial products, these FSIs are important conduits for the transmission of new skills and knowledge into the countryside. They are the intermediaries that will help to bridge the gap between the modern and traditional sectors in a typically dualistic economy.

CHRONOLOGY OF DEVELOPMENT THROUGH THE CULTURAL REVOLUTION DECADE

The systematic promotion of the "five small industries" had begun with the Great Leap Forward (GLF), when ambitious plans were made to expand rapidly output of certain key products through resort to less advanced technologies. Millions of "backyard furnaces" were erected to produce native pig iron to feed into modern steel mills. Farm machinery plants were set up at the county and commune levels to produce a variety of farm machinery. Large numbers of chemical fertilizer plants went up in communes and brigades to produce fertilizers ranging from ammonium sulfate to processed nightsoil, etc. Unfortunately, under the generally chaotic and frenzied atmosphere during the GLF, little attention was paid to whether production processes were suitable for small-scale, labor-intensive operation. The bulk of these small plants were set up without prior investigation of raw material availabilities. In some cases, no market could be found for products from the newly-promoted industries (e.g., phosphorous fertilizers), resulting in wasted capacity.[13]

The disastrous failure of the GLF and the ensuing economic crisis caused massive retreats from all GLF programs, including the rural industrialization campaign. Rather than a complete abandonment of rural industries, however, the 1961–65 period was characterized by a much more cautious approach to their development. By 1963, with gradual economic recovery, the construction of small plants began to be revived in the chemical fertilizer, farm machinery and cement industries, and a good deal of effort went into improving their technologies, developing standard designs and standard plant scales, and setting standards for product quality.

The Cultural Revolution greatly accelerated the development of rural industries. The 1968–73 period saw very large numbers of plants set up in the FSIs, based mainly on the improved technologies developed during the early 1960s (see Table 2 for a periodization of the rural industrialization effort). Even though development was slowed down by the economic stagnation and policy vacillations in the 1974–76 period, the FSIs had become major components of their respective industries by the end of the CR decade.

II. "TECHNOECONOMIC" VIABILITY

In order to assess the development of the FSIs as an experiment in the application of intermediate technology, we must first look at the economic viability of the technologies they employ, which is determined primarily by the importance of scale economies in the production process, local availability of resources, and the complexity of the production technique. Due to the extremely underdeveloped transport system in China, for industries whose markets are dispersed over the countryside, the transport-saving advantage of production in dispersed, small-scale plants should not be underestimated. However, whether these savings sufficiently compensate for the diseconomies of small-scale production depends upon the magnitude of the scale economies, as well as whether resources are locally available. The complexity of the production technique is another determinant of the industry's suitability for dispersed, small-scale production, since the technical absorptive capacity of the local labor force acts as a constraint on how far the industry can be decentralized.[13a]

Due to differences in their production processes, the FSIs have turned out to be differentially suited to decentralized production in small-scale plants. Among the most successful [13b] are cement and hydroelectricity, where locational advantages of small-scale plants are most marked.

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[13] For an excellent summary of Great Leap Forward activities in rural industries, see Carl Riskin (1971).

[13a] Throughout this section, the terms "decentralization" and "decentralized" refer to a geographically dispersed production pattern, rather than the level of decision-making.

[13b] "Success" is defined according to current Chinese prices in this section. A small plant is "successful" if it provides output at a cost that is less than or equal to the cost of obtaining the same output from an alternative source. For the sake of analytical clarity, problems with this definition are deferred until later sections.

CEMENT

In the cement industry, small-scale plants indeed have the advantage of requiring a relatively small investment and a short gestation period for construction. Since cement is a bulky, low-value product that cannot be economically shipped over long distances, small plants often enjoy clear cost advantages over large plants in serving local markets. Many examples have been cited in the Chinese press to substantiate this. Because raw material resources are fairly ubiquitous and the production technique is relatively simple, production of cement in small plants has been extremely successful in expanding output through the CR decade: with annual output growing at a rate of five million tons per year, it has been the fastest growing rural industry in the past ten years (see Table 3 for output data).[14]

HYDROELECTRICITY

The chief advantage of small hydroelectric stations is that decentralized, local power generation can bring very substantial savings in transmission costs: in Guangdong's Fogang County, a production team built a small hydroelectric station with a capacity of 20 kilowatts at a cost of over 2,000 yuan, to provide its own supply of electricity. Its alternative of hooking up to the power network at the county capital would reportedly have cost over 40,000 yuan.[15] As is typical of many developing countries, China's electricity supply networks are regionally fragmented, limited in size and confined primarily to the industrial centers. Vast areas of the countryside are still without access to power supplies. The construction of small power stations serving local needs is an obvious way of providing motive power needed for the modernization of agriculture. Because of the widespread construction of small hydroelectric stations, China is now able to provide electricity to some 50–60% of its rural villages.[16]

IRON AND STEEL

The clearest case of failure in the development of small plants is the iron and steel industry, where the retrenchment closed down or suspended more than 300 of the existing 500 small plants.[17]

Even with an improved "small modern" blast furnace developed after the Great Leap Forward, small iron and steel plants seem to be plagued by three major problems: (i) they suffer from significant diseconomies due to their small scale; (ii) good quality iron ores and coking coal are not geographically widespread; and (iii) they are unable to make use of low quality local ores. Aside from some isolated examples where local conditions are particularly advantageous, small plants seem to have relatively unfavorable raw material and fuel consumption rates. At Hebei's Handan Iron and Steel Plants, for example, the six small blast furnaces reportedly used nearly twice as much electricity as the three medium furnaces, and their coke consumption rate was 50 percent higher. Aside from their resulting higher production costs, the small furnaces were also said to have turned out pig iron of comparatively lower quality.[18]

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[14] NCNA 1/21/80, in BBC W 1068/A/17.

[15] "Go All Out to Develop Rural Small-Scale Hydroelectric Stations," Peking People's Press, Dec. 1972, p. 5.

[16] Over 80 percent of communes, 60 percent of brigades, and 50 percent of all teams in China repeatedly had access to electric power. (Peking Home Service, June 18, 1979, BBC W 1038/A/7–8). In comparison, Radio New Delhi reports that by March, 1979, 227,000 of India's 576,000 rural villages, or less than 40 percent had been provided with an electricity supply. (BBC W 1059/1).

[17] NCNA, Nov. 19, 1980, in BBC W 1119/A/6.

NITROGENOUS FERTILIZERS

Recent closures of small-scale nitrogenous fertilizer (NF) plants have attracted special attention. Coming at a time when all 13 pairs of large-scale ammonia-urea plants imported during the 1973–74 period have gone onstream, the obvious question is whether small plants have outlived their usefulness. A careful reading of the Chinese press uncovers conflicting views regarding the small-scale sector. On the one hand, small plants have been widely criticized for their high cost, high consumption of raw materials and fuel, low product quality, and for running persistent losses. Many provinces have announced plant closures, and China re-entered the world market at the end of 1978 to sign contracts with a Japanese company for three more ammonia plants.[19] Yet, at the same time, reports of substantial improvements in the operation of small plants have come from a number of provinces.[20] A Hunan Provincial conference concluded that the problems associated with small fertilizer plants stemmed mainly from poor management, which was not considered intractable.[21] Similarly, Fujian Province announced plans in 1979 to build ten more small plants, aside from upgrading and expanding existing ones.[22]

Many of the problems faced by small nitrogenous fertilizer plants are not dissimilar to those afflicting other industries. Bottlenecks in the supply of coal, electricity and transport have kept small plants in many localities operating far below capacity, thus resulting in high costs and high consumption rates.[23] Their technical problems can be mainly attributed to their rapid growth, when proliferation of small NF plants in the CR decade outstripped machine-building capabilities, so that many of the small plants were operating without a complete set of equipment. The regional dispersion of this machine-building capability led in some cases to drastic deterioration in quality, which contributed to problems in plant operation.[24] The rapid growth in demand for technical and skilled workers to run the machinery undoubtedly stretched existing supplies to the limit, especially in the absence of well-organized efforts to run training courses.

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[18] RMRB, Aug. 2, 1979.

[19] CIA, "China's International Trade Quarterly Review, 4th Quarter, 1979," ERCIT 80-003, May 1980, Table 10.

[20] For example, see Anhui Provincial Service, June 18, 1979, in BBC W 1049/A/7; Guangdong Provincial Service, Aug. 16, 1979, in BBC W 1049/A/21; Hubei Provincial Service, Aug. 8, 1979, in BBC W 1049/A/22, etc.

[21] RMRB, Aug. 7, 1979.

[22] Fujian Provincial Service, Mar. 2, 1979, in BBC W 1025/A/11.

[23] The problem of underutilization of capacity is very serious. For example, in 1977, Hunan had a total capacity of 540,000 tons of ammonia (enough to produce over 2 million tons of nitrogenous fertilizer) and 1.5 million tons of phosphorous fertilizer per year. Actual output was only 2.15 million tons. (NCNA, Jan. 6, 1978, in BBC W 971/A/16, and Hunan Provincial Service, Dec. 30, 1978, in BBC W 1017/A/15). Even in 1980, it was said that because of insufficient electricity supplies, 25–30 percent of the productive capacity in China's synthetic ammonia plants could not be utilized. JJGL(3) 1981, pp. 12–15, in Economic Affairs 136, p. 24.

[24] By 1971 or 1972, at least half of the provincial level units had acquired the knowhow to make complete sets of equipment. See Christine Pui Wah Wong, "Rural Industrialization in the People's Republic of China : A Locational Analysis of Chemical Fertilizer Production," in Lee Ngok and C. K. Leung, eds., "China : Development and Challenge," Proceedings of the Fifth Leverhulme Conference, Volume II, University of Hong Kong Press, 1979.

In addition to these problems, however, small plants face some fundamental disadvantages in vying with large-scale, imported plants as an economic option for providing fertilizers. First, the coal-based technology that they employ is considered technically inferior because it is associated with larger capital requirements as well as higher unit production costs. Also, scale economies have proven to be very significant in the high temperature, high pressure chemical processes at both the intermediate step (producing ammonia) and at the final step (producing finished fertilizers).[25] In order to tap such scale economies, modern ammonia plants are generally built with annual capacities of 300,000 tons or more. In contrast, a standard county-run plant in China has an annual capacity of 3,000–5,000 tons. For these reasons, outside observers generally consider small plants to be a stop-gap solution for providing fertilizers, which would be obviated as China's international options widened.

Indeed, at the prices prevailing in 1973–1974, the large modern plants were not only technically, but economically far superior to the small plants, with investment cost per annual ton output as much as 50 percent lower, and unit production costs only one-third to one-half as high as those of small plants (on basis of 100 percent N).[26] However, since 1974, worldwide inflation has more than quadrupled the prices for Western equipment and technical knowhow as well as for energy. These new prices have changed the relative balance dramatically in favor of the Chinese-made, coal-based small plants, so that by mid-1980, the two options seemed to be fairly even. [27] At the very least, the continued survival of small plants seems to be ensured by the secular rise in the price of fertilizers imported from Japan, which was by the 1980–81 fertilizer year nearly 50 percent higher than production costs in small plants (100 percent N).[28]

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[25] See R. Disney and H. Aragaw, "The Choice of Technology in the Production of Fertilizers: a Case Study of Ammonia and Urea," World Development, 1977, vol. 5, No. 9/10.

[26] At an average cost of $41.6 million (U.S.) per pair, at the current exchange rate, the plants imported during 1973–74 cost 81.5 million yuan for machinery, equipment (c.i.f.) and engineering charges. With an additional 80–100 percent added for site construction and infrastructural costs, this results in an investment cost of 650–730 yuan per ton of annual nutrient output (100 percent N). For small plants, this investment cost ranges from 800 to over 1,000 yuan. A report from the Chongqing Chemical Fertilizer Plant completed by the Japanese in 1976 claimed that by Sept. 1979, the plant had produced 1.41 million tons of urea and provided the State with profits of 279 million yuan (Peking Home Service, Dec. 4, 1979, in BBC W 1066/A/18). With State price of 320–350 yuan per ton for urea, this implied profit of 198 yuan/ton reduces to a production cost of 120–150 yuan per ton (46 percent N), or 260–326 yuan per ton nutrient. Production costs for a typical, well-managed small plant is about 650–714 yuan/ton N. For more details, see Christine Wong, "Rural Industrialization in the People's Republic of China," April 1981, a paper prepared for the World Bank.

[27] A study presented to the FAO Fertilizer Commission in July 1980, estimated that the cost of a plant similar to those purchased by China in 1973–74 (with productive capacity of 1,000 tons of ammonia and 1,650 tons of urea per day) has risen to U.S. $190 million (c.i.f.) before site construction and infrastructure costs. With site construction and infrastructural costs, the study estimated that the total cost of an ammonia-urea plant using natural gas as a feedstock would range from $200–240 million at a site with existing infrastructure, to $240–360 million at a site with partial infrastructure, and $360–440 million at a site with no infrastructure. If construction of a major port or railroad facility is required, this cost could be even higher. (William F. Sheldrick, "Investment and Production Costs for Fertilizers," Paper presented to the FAO Fertilizer Commission, Sixth Session, Rome, July 1980.)

[28] The average price of shipments of ammonium sulfate and urea sold by the Japan Ammonium Sulfate Export Company to China during the 1980–81 fertilizer year was U.S. $594 per ton N. (Kyodo in English, Feb. 4, 1981, in BBC W 1121/A/22).

CONCLUSION

In their pioneering study of small-scale industries, Staley and Morse found a number of "technoeconomic" factors which allow small plants to predominate in certain manufacturing industries. These factors include locational influences, which favor factories processing dispersed raw materials and those whose products serve local markets. Process influences favor industries with separable manufacturing operations, craft handwork, and simple assembly, mixing or finishing operations. Finally, market influences favor small plants in industries with differentiated products having low scale economies as well as those serving small total markets.[29] The Chinese experience in the development of the five small industries confirms that it is indeed these factors, rather than the amount of state aid, which determine the "decentralizability" of industrial production.

Aside from state allocations of machinery, the nitrogenous fertilizer industry received a good deal of support from state research institutes, which brought a number of technical breakthroughs to raise the efficiency of small-scale production. However, because iron ores and coking coal are not usually locally available, small iron and steel plants remained unviable despite large subsidies in financial and technical support. Similarly, in spite of vast amounts of aid from central and provincial authorities, production of handtractors and diesel engines in local plants became the most dramatic failure of the CR attempt to decentralize industrial production, because of enormous difficulties in coordinating the production and assembly of the large number of component parts, particularly in hinterland locations.

On the other hand, because its resources are ubiquitous, its production technology relatively simple, and its scale economies less significant, the production of cement in small plants has been quite successful even though the industry has not been a major claimant of state subsidies. Table 4 presents a summary of the main characteristics of industries covered in this study. Not surprisingly, satisfaction of the underlying assumption of widespread availability of resources constitutes the minimum feasibility condition for local production. Beyond that, simple, straightforward production processes involving few inputs are more easily adopted into the rural environment where managerial and technical skills are relatively scarce, and coordination of inputs more difficult due to the lack of agglomeration economies. These findings are consistent with UN reports of rural industrial activities in other developing countries.[30] Finally, whether intermediate technologies are the optimal choice depends on the costs of alternative choices, as demonstrated by the development of small-scale nitrogenous fertilizer plants.

III. ADMINISTRATIVE PROBLEMS

Technoeconomic viability is necessary but not sufficient to guarantee success in small-scale production: Widespread closure of plants outside of the iron and steel and farm machinery industries in the past two years indicates that problems in the FSIs are not confined to techno-economic factors. Even in the cement industry, for example, there is currently a moratorium on new small plant construction due to problems of substantial underutilization of existing capacity. Undoubtedly some of this stems from the general problems of insufficient raw material supplies and inadequate infrastructural support that plague the industrial sector as a whole. Nevertheless, it raises the question of why construction of small plants was allowed to continue in the face of these supply difficulties. Indeed, most instances of locational irrationality in plant construction can be traced to problems of an administrative nature. Clearly, the campaign style of work during the Cultural Revolution was not compatible with application of systematic economic criteria to project evaluation, when all such efforts were denounced under the label of "economism."

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[29] E. Staley and R. Morse, "Modern Small Industry for Developing Countries" (N.Y., McGraw Hill, 1965), chapters 5 and 6.

[30] See, for example, UNIDO, "Small-Scale Industries in Latin America."

> Whenever we talked of "going all out" to do something, financial, material and labor resources were summoned up, and nobody talked about economic results. (For example), once it was stressed that the "five small industries" should be developed to aid agriculture, each (administrative) level went out and built an "independent and complete system of industries to aid agriculture", without regard to whether it was permitted by objective conditions.[31]

In the current Chinese press, much of the blame for problems of high costs, low technical level and low capacity-utilization in industrial enterprises is placed on the duplication of plants that took place under the "ultraleftist" policy of encouraging "self-reliance and self-sufficiency," in disregard to considerations of comparative advantage and economies of scale. However, this tendency toward vertical integration on a regional basis is itself a product of China's economic structure, and which is reinforced by policies in the pricing and allocation of industrial products. We turn now to the administrative framework for the FSIs and the concept of "self-reliance and self-sufficiency."

ADMINISTRATIVE FRAMEWORK

The administrative system for the FSIs is extremely diverse in character. While the county level plays a key role in coordinating rural industrial activities, the other four subprovincial administrative levels of prefecture, people's commune, production brigade and production team all participate in the development of the FSIs. In general, the system developed during the CR decade can best be characterized as a flexible application of the principle of self-reliance, with its corollary of "He who pays the piper calls the tune."

In line with China's dualistic development strategy, which called for localities to run industries with their own capital and resources in order to minimize the burden on higher levels, local self-reliance was emphasized in the development of the FSIs The general principle seemed to be to run plants at the lowest possible administrative level according to their technical and financial requirements. Adherence to this principle has generated a hierarchical structure of enterprises such that the size and technological complexity of the production unit are strongly correlated with the planning level which administers the units. This hierarchical structure was most clearly manifested in the farm machinery industry, where simple farm tools were made at the commune and brigade levels, small processing machines were made at the county level, small tractors and motive engines at the prefectural and provincial level, etc. Similarly, because of the small investment cost and simple capital requirement, small hydroelectric stations were mainly built by collective units of production teams, brigades and communes, with State participation only at the larger hydraulic sources. In this way, the financial and material burden of many investment projects could be transferred downward to the lower administrative units.

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[31] JJYJ(7), 1980, p. 49.

Even so, self-reliance was not always possible: investment costs for some of the FSIs were clearly beyond the financial resources of the localities, and the production machinery often had to be allocated by the higher levels. In such cases, very substantial allocation of funds and materials were made available for local development of small plants in such key industries as nitrogenous fertilizer, iron and steel, and for handtractor and diesel engine production.

At this point it is important to distinguish between the two types of ownership which prevail in rural industrial enterprises. At the prefectural and county levels, enterprises are primarily State-owned, whereas they are mostly owned by the collective at the commune, brigade and team levels. In general, State subsidies are extended only to State-owned enterprises. During the CR decade, when collectives were often viewed as a transitional, lower state of political development, authorities were especially loath to pass along any resources to them. Because of this, key industries requiring State subsidies were run at the county and prefectural levels, with some correspondence between the productive capacity of the plant and the size of the market within the administrative unit.

Given the substantial injections of financial, material and manpower resources from higher levels, the concept of self-reliance is much more complex for enterprises within the state-owned sector. For undertakings that were beyond local financial capabilities, a "self-reliant" solution took many forms.[32] Localities borrowed from state banks or subordinate units. Press reports on rural industrial development often suggested that localities run profitable light industries to accumulate the necessary funds.[33] Jon Sigurdson cites a case where a county was "allocated" a highly profitable paper factory to help it run the local iron and steel plant.[34] Where local conditions were insufficient, direct subsidies were sometimes granted by higher levels. A Hunan prefecture reported that it built factories in counties with relatively weak industrial bases to promote a more equal distribution.[35] In Jiangsu, while most counties in the affluent south financed their own nitrogenous fertilizer plants, the poorer northern counties received aid from the province.[36] If local subsidies were not enough, Central appropriations were used as a supplement, according to a case reported in Shandong Province.[37]

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[32] Jingji Daobao (Economic Reporter, Hong Kong) (JJDB) Jan. 1, 1976, pp. 10–13.

[33] For examples, see RMRB July 17, 1972, in SCMP 5185, pp. 13–19; and RMRB May 29, 1972, in SCMP 5151, pp. 172–7.

[34] Sigurdson (1977), pp. 192–3.

[35] Ibid., p. 130.

[36] JJDB Jan. 1, 1976, pp. 10–13.

[37] NCNA Jan. 24, 1974, in SCMP 5546, pp. 73–74.

Self-reliance was also emphasized in the provision of production machinery. A State Planning Commission article in the People's Daily explained that this was necessitated by the large number of new plants which are put into operation each year: ". . . if they all depend on our machine-building industry for the supply of equipment and supply is to be guaranteed by the State, it will be impossible to meet their needs." [38] While there were over 100 factories specializing in manufacturing chemical fertilizer equipment for large-scale plants, "the equipment for small country- and commune-run plants has to be made *in the provinces concerned*, by relying on their own efforts" (emphasis added).[39] However, where they were not produced in sufficient quantities in the province, allocations were made by the Central departments. Examples of this were also numerous in the farm machinery industry. For industries requiring simple equipment, it was made at the lowest possible level: hydroturbines for small hydroelectric stations were often made even at the commune and brigade levels.

The system is further complicated by the fact that any administrative level that has made a contribution to the construction or operation of an enterprise has a claim on its output, based on the principle of "whoever builds and manages a plant has the use of its products." Typically, localities are allowed to keep all of the output of nitrogenous fertilizer and iron and steel from their small plants and half of the output from small nonferrous metal industries. Small coal mines and cement plants are assigned annual quotas for delivery to the State; all remaining output is kept by the localities. For tractors and small motive engines, the policy is for localities to retain a portion of their assigned output, with extra plan output divided equally between the locality and the State.[40] An interview with officials from a county-run nitrogenous fertilizer plant in Guangdong Province revealed the rule-of-thumb to be that plants built with provincial or prefectural finance must "remit" a part of their fertilizer output for distribution outside the county.[41]

With the claim on output comes the responsibility for ensuring raw material supplies and sharing profits and losses. In the nitrogenous fertilizer industry, it appears that plants built with provincial aid receive coal allocations from the province, while plants built with local funds often must find their own supplies. Where enterprises run chronic deficits, there are even State subsidies to their operating budgets: the five small NF plants in Shaanxi's Xianyang Prefecture reportedly receive 16 yuan from the state for each ton of output.[42]

SELF-RELIANCE AND DECENTRALIZED DEVELOPMENT

Self-reliance and its corollary of "Whoever builds and runs an enterprise has the use of its products" were intended to provide a quasi-market setting for the development of rural industries such that the locality acts as a profit-maximizing unit responsible for supervising enterprises under its jurisdiction. Within this framework, the local administrative unit has a great deal of incentive to steer development in the direction suggested by its comparative advantage.

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[38] RMRB Sept. 6, 1970.

[39] Hsiang Jung, "An Effective Way to Speed Up Chemical Fertilizer Production," PR No. 32, Aug. 8, 1975.

[40] GMRB Jan. 15, 1978.

[41] Interview at Kaiping County, Guangdong, May 1978.

[42] JJGL 1979 (10), pp. 39–40.

Given the substantial subsidies and the complex web of interaction among administrative levels in the development and operation of the FSIs, this quasi-market framework was in practice seriously eroded. Nevertheless, since local governments were undoubtedly under at least periodic pressures to balance their accounts and to fulfill their financial tasks, the principle of self-reliance could be, and often was, turned into an extremely counter-productive guideline.

In order to minimize losses, self-preservation leads localities (more accurately, local cadres) to try to monopolize local markets, thus exacerbating the "cellular" characteristics of the economy.[43] Within the present administrative framework, localities have a great deal of power to provide protection for their infant industries. Because they control the flow of goods into the local market through control of the Materials and Resources Bureau (*wuzi ju*) and commercial departments, they can set up barriers to "imports" from other regions. A recent editorial in the journal Economic Management charged that local governments often manipulated the market to protect their own high-cost industries: they ordered their commercial departments to buy from local sources without regard to cost and quality; they monopolized the local market by refusing entry to "imports;" and when they could not keep out imports, they intentionally ordered low quality, high price imports over better ones in order to enhance sales of local products.[44] Furthermore, this monopolistic control sometimes allowed them to raise the market price to sustain ailing enterprises.

PRICING POLICY

Even without manipulation by local authorities, the continued survival of inefficient, small plants is aided by various indirect forms of support provided by the institutional structure. In contrast to Soviet practice, Chinese prices on producers' goods tend to be high. The large profit margin created by this practice allows less efficient plants to coexist with more efficient ones. This point can be illustrated with the aid of Figure A.

In meeting its requirements of a given commodity, a locality faces two alternatives (ignoring for our purposes the third alternative of foregoing satisfaction of this requirement): (i) purchase the needed quantities from the outside; and (ii) produce them locally. Given cost curves L and P (with slope p representing market price of the commodity), X is the minimum economic size for starting up local production. Ceteris paribus, raising the market price for the commodity increases the slope of P and rotates it counterclockwise, reducing the minimum economic size for local production. At higher price p′, the curve representing the cost of outside purchase is P′, and the minimum economic size unit for local production is reduced to X′.

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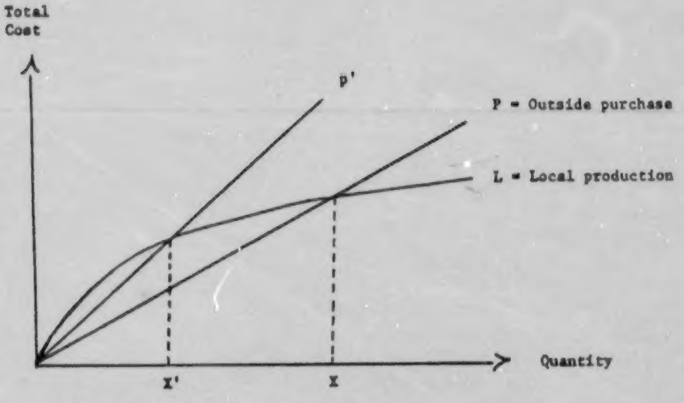
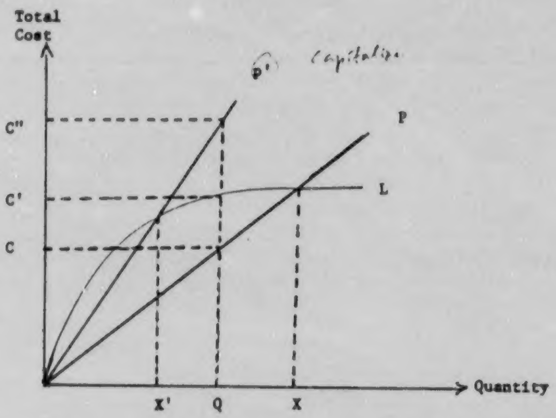
[43] See Audrey Donnithorne, "China's Cellular Economy: Some Economic Trends since the Cultural Revolution," China Quarterly No. 52, October–December, 1972.
[44] JJGL, 1979 (2), p. 57.

Figure A



This analysis suggests that if the market (State) price is set at a level above the opportunity cost of production (taking into account transport cost), a decision made by local governments based on cost minimizing considerations can lead to a socially suboptimal choice, with the degree of suboptimality directly related to the size of the gap between price and shadow production costs in the state sector. This can be demonstrated with Figure B below. If the costs of local production L are estimated correctly according to opportunity costs, and if P represents the opportunity costs of production in the state sector, a demand of Q can be supplied from production in the state sector at a cost of C. From the local perspective, however, local production is the optimal choice since C′ is lower than the cost of purchasing from the state sector C″, if state price is set at p′.

Figure B



The existence of wasteful duplication of plants and excessively small scales of production in the FSIs can be at least partially attributed to this pricing policy in the State sector. This is manifested in the cement industry, where small plants of different sizes operated by county, communes and brigades are often located alongside one another in the same area, with all plants operating below design capacity. For example, in Guangdong's Nanhai County, there were in the mid-1970s eight county-run plants with a combined annual output of 100,000 tons, divided among two plants each producing over 50,000 tons, and six plants each producing less than 10,000 tons.[45] In addition, there were 27 commune-run plants which produced a total of 8,000 tons in 1972, or an average of 300 tons in each plant.[46] Similarly, in Henan's Hui County, there were 37 cement plants producing 200,000 tons per year in 1977.[47] Aside from the county-run plant, which had an annual output of over 130,000 tons, the other 36 had a combined annual output of 70,000 tons; less than 2,000 tons in each plant.[48]

While the locational rationale indicates that optimal plant sizes tend to be small in an environment with high transport costs and insignificant economies of scale, it cannot explain the coexistence of plants of various sizes side-by-side in a small area. The most likely reason for this anomaly is that the price of cement is excessively high relative to costs: with regional variations, the price is about 40–50 yuan per ton, compared with production costs of 30–36 yuan.[49] This large profit margin allows many inefficient local producers to survive, even beyond the buffer provided by transport costs.

BUREAUCRATIC COSTS

The effects of this pricing policy are reinforced by the material distribution system. The "system of successive hierarchial administrative rationing" in which plants must make application for resource allocations through the successive layers of bureaucracy imposes a high effective price on products from higher levels. The costs of delays and uncertainty in getting approval for the application constitute "bureaucratic costs" which have an analogous effect of rotating P (refer to Figure A) counterclockwise and reducing the minimum economic scale for local production.[50]

These "bureaucratic costs" become greatly inflated when supplies from higher levels are scarce and undependable. In recent years, it is said that because of severe shortages, State supplies of the "three materials" (iron and steel, cement and lumber) for construction projects were basically allocated according to the "three-eight style": (i) allocations were made to cover eight-tenths of the amount needed; (ii) units were allowed to order only eight-tenths of the amount allocated; and (iii) deliveries covered only eight-tenths of the amounts ordered.[51] Given these circumstances, it is explained that "... In order to (obtain supplies needed) in aiding agricultural production and solving problems created by urban growth, many localities were forced to build duplicate plants and engage in blind production in disregard to resource and technical conditions, in disregard to (input) consumption rates and profitability.[52] Indeed, single-plant profitability becomes irrelevant when the shadow price a locality is willing to pay far exceeds the market price, when the high cost output of an inefficient plant is essential for relaxing bottlenecks elsewhere in the local economy.

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[45] DGB Sept. 29, 1976.

[46] NCNA Sept. 9, 1972, in SCMP 5220, pp. 148–9. The continued existence of these plants was confirmed in DGB Sept. 29, 1976.

[47] NCNA November 19, 1977, in BBC W 959/A/17.

[48] Perkins et al., pp. 182–3.

[49] Xiyang County's cement plant faces production costs of 30 yuan per ton, with prices set at 38 yuan/ton. (Perkins, et. al., pp. 182–3); Lin County Cement Plant has production costs 36 yuan/ton, with prices set at 47 yuan/ton (Sigurdson (1977), pp. 156–7); a plant producing 100,000 tons/year can reportedly hold production costs at 31 yuan/ton (PR No. 49, 1972).

[50] This analysis is drawn from Perkins et al. (1977), chapter 2.

[51] JJYJ 1979 (2), p. 12, also, JJYJ 1980 (b), p. 28.

This tendency for localities as well as enterprises to move toward vertical integration in order to minimize production risks due to undependable supplies of raw and intermediate inputs was ideologically sanctioned under the banner of "self-reliance and self-sufficiency." "In the past few years, we took the normal cooperation and exchange relationships and criticized them as (passively) waiting, relying on and demanding from (higher levels). We one-sidedly emphasized raising a region's self-sufficiency rate in producing and supplying products. This "small peasant mentality" of doing everything for oneself and never asking for help is now criticized as feudal and backward and incompatible with a modern industrial society.

INEFFECTIVE CONTROL OVER LOCAL INVESTMENT

The problems of duplication of production are also partly the natural outcome of the relatively unrestrained growth in local industries in the absence of effective coordination from above. The farm machinery industry provides a good illustration. With an organizational structure that of a multi-layered hierarchy, there is a strong correlation between the administrative level at which the plant is run and the degree of complexity of the technology employed. At least in theory, there is a division of labor among the layers such that central and provincial level enterprises produce large tractors, combines, and medium and large motive engines, prefectural plants make small and medium tractors, small diesel engines, and county-run plants produce small electrical machinery, mechanized and semi-mechanized implements such as threshers, water pumps, rice transplanters, etc.

This hierarchical arrangement allows the simpler FMs to be made in the smaller plants at lower administrative levels, leaving the larger plants at higher levels to concentrate on producing complex machines. However, this division of labor gradually broke down as lower level units found their markets quickly saturated. With everyone stressing self-reliance in providing farm machinery, expansion of sales to other areas was often difficult. The example from Jiading County illustrated that the only avenue for expansion was to move up the technological ladder and begin producing more complex products. This brought them eventually to duplicating efforts at higher level units as they began to encroach upon higher level tasks.

Much of the present problem of an overextended capital construction front can in fact be traced to the increased local construction activities in pursuing vertical integration. When centrally allocated investment continues undiminished and localities undertake an increasing number of projects on their own, the total amount of investment is increased. During the Great Leap Forward, when self-reliant local development was encouraged, the savings rate jumped from a level of 20–25 percent of GNP during the First Five Year Plan period to around 40 percent of the GNP. This was brought down to a level of 22.7 percent during the recentralization phase in 1963–65, but decentralization again raised the savings rate during the CR, so that for the period of 1970–76 it averaged 31–34 percent. With the political chaos and economic stagnation of 1974–76, local activities increased even further. By 1978, the savings rate had reached 36.6 percent, and the number of construction projects undertaken greatly exceeded the availability of funds and materials.[53]

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[52] JJGL 1979 (10), p. 10.

CONCLUSIONS

In this section we have isolated four types of administrative problems in the FSIs: (i) those stemming from incorrect policies such as the excessively high prices which protect inefficient plants; (ii) those stemming from specific policy choices now out of favor, such as the encouragement of regional self-reliance and self-sufficiency, which allowed many plants to be built in spite of their high costs and lack of resources; (iii) those stemming from systemic characteristics, e.g., high "bureaucratic costs" of obtaining supplies from the State, which reduce the minimum economic size for setting up local production; and (iv) those stemming from political instability in the CR decade, such as the loss of effective control over local investment. All these problems are in fact closely interrelated, and all are very much influenced by factors outside of the rural industrial sector. What we found was a vicious circle: undependable supplies from higher administrative levels provided an impetus for localities to build their own enterprises to circumvent supply bottlenecks. An enlarged number of plants competing for the same resources led to diminished and even more undependable supplies, etc. And the situation was greatly exacerbated by the extremely ambitious plans which called for rapid economic growth in spite of emerging bottlenecks in a number of key sectors.

IV. POST-MAO READJUSTMENT AND FUTURE PROSPECTS

The death of Mao Zedong and the arrest of the "Gang of Four" in late 1976 brought an end to the Cultural Revolution decade and ushered in a "New Period" of readjustment and rectification. Since 1977, thousands of industrial enterprises have been closed down, suspended operation, merged or switched to different lines of production. It is simply said that the present supplies of raw materials, fuel and electricity are insufficient to support the existing 350,000 enterprises. Among these closures, many are in the FSIs.

Beginning with Vice Premier Yu Qiuli's summary report at the Third National Conference on Farm Mechanization in January 1978, plant closures have been announced in all FSIs except small hydroelectric stations. The farm machinery industry has been the most seriously affected, where all local, small plants producing handtractors and diesel engines are being reorganized and demoted to producing one or two components; and they are to be incorporated into subcontracting networks under provincial direction.[54] High costs, low quality and a variety of marketing problems have forced curtailment of production in other FM plants. For example, Hubei Province's FM industry reduced its output-value from 438 million yuan in 1978 to 380 million yuan in 1979. This was further reduced to a target of 270 million yuan in 1980, leaving idle nearly half of the industry's capacity of 500 million yuan per year.[55] Many plants have even been retooled to make consumer appliances such as sewing machines and electric fans.[56] Over 300 of the country's 500 small iron and steel plants were closed in 1979 and 1980.[57] In some regions the closures were even more sweeping: Henan closed 21 of its 28 plants,[58] and Guangdong announced plans to retain only 8 of its 36 plants.[59] In the nitrogenous fertilizer industry, Guangdong closed down one-sixth of the 90-odd small plants;[60] Shandong consolidated or closed down 49 of its 135 plants;[61] and closures were reported in many other provinces to conserve scarce supplies of coal and electricity for more efficient plants. In the cement industry, after completing a study of small plant operations in October 1979, the Ministry of Building Materials called for a three-year moratorium on building new plants.[62]

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[53] BJR No. 29, July 21, 1980, p. 18.
[54] RMRB Jan. 29, 1978.

SHORT-TERM OUTLOOK

On the whole, aside from the fairly sweeping closure and merger of small plants in the farm machinery and iron and steel industries due to their technical problems, readjustments in the FSIs have been cautious and pragmatic in nature, aimed at weeding out the smallest and most inefficient plants. Even in the iron and steel industry, for example, the closures reduced blast furnace capacity by just 12 percent.[63] Similarly, although Shandong closed more than 35 percent of its small nitrogenous fertilizer plants, it reduced the province's productive capacity by less than 25 percent.[64] With the elimination of the most inefficient plants, greater political stability and better coordination of production, the worst irrationalities and bottlenecks of the CR decade are being alleviated, and performance in the FSIs has already begun to improve. Encouraging results in lowering input coefficients and raising output have been reported in various FSIs. Even small iron and steel plants reportedly ran in the black in 1980, ending a long string of deficits.[65]

While it appears that rectification of existing rural industries will be moderate, the new emphasis on economic results over ideological objectives will bring a new orientation to future development. Regional redistribution efforts will give way to concentrating resources in the more developed areas, where rates of return to investment are expected to be higher. During the CR decade, very substantial state subsidies were allocated as "geographic transfer payments" to help less developed areas set up industrial enterprises. In the nitrogenous fertilizer industry, for example, central allocation of equipment played a key role in equalizing the distribution of plants across provinces. Within provinces, provincial and prefectural governments often provided technical and financial assistance to poorer counties in their efforts to build small fertilizer plants.[66] In the farm machinery industry, a great deal of support was similarly given to many prefectures in setting up production facilities for handtractors, rather than allowing such facilities to remain concentrated in a few urban centers.[67]

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[55] Hubei Provincial Service, Nov. 8, 1980, in BBC W 1110/A/19.
[56] NCNA Apr. 12, 1980, in BBC W 1084/A/18.
[57] NCNA Nov. 3, 1980 in BBC W 1119/A/6.
[58] NCNA May 6, 1980, in BBC W 1084/A/26.
[59] Guangdong Provincial Service, Mar. 14, 1980, in BBC W 1075/A/1–2.
[60] Nanfang Ribao July 29, 1980, in JPRS 76545, Economic Affairs No. 89.
[61] NCNA June 29, 1980, in JPRS 76115, Economic Affairs No. 72.
[62] Peking Home Service, Oct. 6. 1979, in BBC W 1055/A/14.
[63] Gongren Ribao (Workers' Daily) December 19, 1979, in JPRS 75110, Economic Affairs No. 41.
[64] See 61.
[65] NCNA July 22, 1980, in BBC W 1096/A/12.

A regional redistribution policy of this type requires that planners ignore comparative rates of return on investment: projects in the hinterland are expected to yield lower rates of return and have longer gestation periods, since infrastructure tends to be weak or nonexistent, and the labor force is less experienced. For example, whereas the ratio of annual profits to fixed assets averages 24.4 percent for China as a whole, it is 34 percent for Jiangsu and 7.7 percent for Guizhou. The cost of investment per annual ton capacity in comprehensive steel mills is over 1,000 yuan in coastal areas, compared with over 3,000 yuan in inland areas.[68] In the extreme cases, where regional redistribution precludes considerations of resource and skill availabilities, this policy can give rise to costly and very visible mistakes such as the small-scale NF plants on Hainan Island. This component of the rural industrialization program will probably be scrapped in the New Period to concentrate resources in areas with better conditions.

The emphasis on short-term economic results will also reorient the rural industrialization program toward the development of light industries and handicrafts, in a reversal of the CR tendency to concentrate on heavy industries. In addition to providing consumer goods to help satisfy demand pent-up over the past decade and created by recent wage and price increases, these small-scale enterprises are seen as an important vehicle for generating new jobs. Having learned some costly lessons in the inappropriate choice of technique and plant scale, planners now emphasize that the scale of operation of an enterprise should be directly proportional to its technical level, with a division of labor such that small-scale plants should be primarily in ". . . industries that require small investment, are relatively labor-intensive, have lower technical content and require equipment that is not necessarily large-scale, such as textiles, garment industries, food processing industries and other consumer goods industries . . ."[69]

With respect to the existing enterprises in the FSIs, criticism has moderated in tone since beginning 1980. While recognizing problems and inefficiencies in many enterprises, a recent article in Economic Research advises a cautious approach in their rectification.

> In comparing the economic effectiveness of medium-sized and small industrial works with that of large ones, we should analyze their economic effectiveness comprehensively and specifically. We should assess it from both the point of view of enterprise accounting and that of national economic accounting. Not only

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[66] See C. Wong (1979), see 24.

[67] For the provincial distribution of these plants, see Christine Pui Wah Wong, "Development of the Local Farm Machinery Industry in the People's Republic of China—An Attempt at Decentralized, Small-scale Production". Paper presented at the Association of Asian Studies Meeting, Los Angeles, California, March-April 1979, table 4.

[68] JJYJ 1980 (6), p. 30.

[69] Wang Xiangming, "On the Position and Role of Medium and Small Industrial Works in the Economic Structure," JJYJ 1980 (6), pp. 56–64.

> should we compare the products of the small industrial works with similar products of the large ones, but we must admit the objective necessity of a definite gap in economic effectiveness due to differences in the technical equipment. Moreover, we must examine whether production at these small industrial works is favorable to the full and rational use of the social labor resources and material resources, whether their products are needed by society and whether the production is favorable to expanded social reproduction.
>
> Some small industrial works compete with large ones for the use of such resources as fuel, electricity and various materials and raw materials, but others do not. If some small industrial works consume a great deal of resources and also compete with the large industrial works for them, then they should give way to insure the rational use of society's limited resources. If small industrial works consume scattered or relatively inferior resources which large ones cannot utilize and their products are needed by society, then even if consumption is somewhat high their production is permissible or even commendable.
>
> By the same token, although the products of some small industrial works are rather inferior in quality and highly priced, they are needed by society but cannot be produced by the large industrial works. Then, the production of such products is still necessary. *This is analogous to having to cultivate poorer land for production when grain production in superior land cannot satisfy society's needs.* (emphasis added)[79]

Given the difficulty China has in manufacturing equipment for large, modern plants, and given the high marginal social cost of foreign exchange earnings, small plants will continue to play an important role in these industries for sometime to come.

LONG-TERM OUTLOOK

In the longer term, improving the performance of the FSIs and preventing the recurrence of present problems will depend crucially upon eliminating the bases for these problems. On the surface, the "techno-economic" problems confronting the FSIs seem easy to identify and easy enough to solve: if small plants turn out to be economically unviable given the current technology, they should be closed down to spare resources for other uses. In practice, real economic viability is difficult to ascertain. Profitability provides an unreliable guide where prices do not reflect relative scarcities. At best, it can be used in China to compare performance of similar plants in the same industry, but problems arise when there are significant regional differences in terms of input prices and quality, such as in the coal industry. At worst, if input prices are artificially low and output prices artificially high, then profitability is a statistical illusion rather than a measure of viability. In order to assess the optimality of the choice of technique in the FSIs, cost-benefit comparisons must be made with all available alternatives, based on true social cost calculations and taking into account the whole vector of characteristics associated with each technique, including product type, product quality, plant scale, resource and capital requirements, organizational form, etc.

Problems of an administrative nature pose an even greater obstacle to improving performance of rural industries in the longrun. Because of their complex interdependencies, eliminating administrative problems will require more than piecemeal reforms aimed at correcting past policies.

Regional self-reliance and self-sufficiency was seen to be the culprit that provided the justification for a good deal of the wasteful duplication of plants, and any meaningful reform in rural industrialization must start with a fundamental redefinition of the concept. However, we have also seen that the abuses that came under the guise of self-reliance often had their roots in the difficulties of getting supplies from elsewhere. To eliminate the "cellular" characteristics of the economy requires that constraints be relaxed "upstream": the tautness of state plans must be reduced, infrastructural support must be increased, and the organizational and administrative structure must be vastly improved in the rural industrial sector to facilitate greater horizontal interaction.

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[79] Ibid., translated in JPRS 76217, Economic Affairs No. 75, pp. 23–24.

One of the main tasks is in strengthening coordination among rural industrial enterprises, an area that was neglected during the CR decade. In the absence of markets, and lacking effective coordination by higher administrative levels, the "self-reliant" development of rural industries had resulted in a good deal of "blindness", duplicating productive capacity and competing for scarce resources. Having long ago grown beyond purely local significance in terms of resources as well as markets, rural enterprises must be either subordinated to and supported by State plans, or be freed to interact with each other through the market.

Whether China chooses to strengthen the planning apparatus or to enlarge the scope of the market, rationalization of the distribution system for producers' and consumers' goods is a crucial link in the necessary reforms. At present, the system is characterized as a method of "three-level management and six types of supplies," where materials are managed at the central, provincial and subprovincial levels, and enterprises receive supplies mainly from the level of administration to which they belong (i.e., centrally run enterprises are directly supplied by ministerial organs, provincial enterprises are supplied by provincial organs, etc.).[71] This fragmentation and duplication of supply organs at the different ministries and levels have contributed significantly to the proliferation of warehouses. Because materials are dispersed in warehouses of the different supply organs and user units, they cannot be circulated effectively. The top-to-bottom flow of materials under the three-level management system not only raises the "bureaucratic costs" of obtaining supplies from above, it also gives rise to the phenomena of central and provincial enterprises getting a glut of materials while local enterprises are "starving to death", since each level has a tendency to take care of its own.

Furthermore, the marketing of products by administrative units severs the link between product quality and enterprise performance as well as shields the inefficient enterprises from competitive pressure. Because of the intervening layer of administrative control, efficient plants supplying high quality products at low cost are not necessarily rewarded with increased orders.

Related to this are the necessary improvements in transport and communications, which would also help to reduce the effective costs of interregional trade. To facilitate the detection of inefficient plants, the price structure must be adjusted to better reflect relative scarcities. All of these reforms take time to implement. Many of them had been proposed in the early 1960s, but their implementation was slow to begin. Some were interrupted by the Cultural Revolution. Their successful implementation in the post-Mao period will depend, at the minimum, on a long period of policy stability.

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[71] Li Yinglu, "The Material-Management System Must Be Reformed," JJGL 1979 (10), pp. 23–27.

Abbreviations

BBC—British Broadcasting Corporation, Summary of World Broadcasts, Weekly Economic Report.
BJR—Beijing Review (Peking Review prior to 1979).
DGB—Dagongbao (Great Justice Daily, Hong Kong).
GMRB—Guangming Ribao (Bright Daily, Peking).
JJDB—Jingji Daobao (Economic Reporter, Hong Kong).
JJGL—Jingji Guanli (Economic Management).
JJYJ—Jingji Yanjiu (Economic Research).
JPRS—Joint Publications Research Service.
NCNA—New China News Agency.
PR—Peking Review.
RMRB—Renmin Ribao (People's Daily).
SCMP—U.S. Consulate, "Survey of China Mainland Press," Hong Kong.
SPRCP—U.S. Consulate, "Survey of People's Republic of China Press," Hong Kong.

TABLE 1.—CONTRIBUTIONS OF OUTPUT FROM SMALL PLANTS, 1978/1979

	Number of plants	Estimated total output (metric tons)	Percent total for industry
Farm machinery (1978):[1]			
County level	1,900 manufacturing plants, 2,400 manufacturing and repair plants.		All simple farm tools, nearly all small and medium farm machines.
Commune level	45,000 repair and assembly plants.		
Brigade level	450,000 repair and assembly stations.		
Nitrogenous fertilizer (1979)[2]	1,500	7,310,000 (ammonia)	55.
Phosphorus fertilizer[3]	Over 1,000	Over 5,000,000	50+.
Cement (1979)[4]	3,400+	49,000,000	67.
Iron and steel (1978)[5]	501	11,000,000[6]	31.6.[6]
Hydroelectricity (1979)[7]	Nearly 90,000	11,600,000,000 kWh 6,330 MW[8]	4-5 (24 percent of hydro-electric output) 12.2.
Coal (1978)[9]	20,000+	276,000,000	45.

[1] "Beijing Review" (5) 1980, p. 7.

[2] NCNA January 14, 1980, in BBC W1078/A/12; and NCNA Nov. 4, 1980, in BBC W1110/A/19.

[3] Estimated. See C. Wong, "Nutrient Supplies in the PRC: an Assessment of the Small-scale Phosphorus Fertilizer Industry," "Current Scene," June-July 1978.

[4] NCNA October 9, 1980, in BBC W1108/A/16–17.

[5] NCNA July 12, 1980, in BBC W1096/A/12; "Gongren Ribao" (Workens' Daily) July 7, 1980, translated in JPRS 76447. "China Report: Economic Affairs," No. 85.

[6] Productive capacity.

[7] NCNA January 4, 1980, in BBC W1074/A/9.

[8] Generating capacity.

[9] NCNA June 6, 1979, in BBC W1035/A/2-3.

TABLE 2.—PERIODIZATION OF RURAL INDUSTRIALIZATION

Phases	Characterization	Speed of development
1. 1958–60 (Great Leap Forward)	Adventurous spirit	Extremely rapid growth.
2. 1961–65	Pragmatic and cautious rectification and rationalization.	1961–62: Retrenchment. 1963–65: Gradual revival.
3. 1966–76 (Cultural Revolution Decade).	Adventurous spirit, but with improved technology and better planning.	1968–71: "Mini-Great Leap," extremely rapid growth. 1972–73: Rectification; more moderate but continued growth. 1974–76: Economic recession—stagnation in some industries, but continued growth in others.
4. 1977 (New period)	Pragmatic and cautious rectification and rationalization.	Continued rapid growth in hydroelectricity. Significant cutbacks in iron and steel and farm machinery. More moderate rectification in chemical fertilizers and cement

TABLE 3.—GROWTH OF SMALL CEMENT PLANTS[1]

[In million metric tons]

	Total output	Small plants share	Percent total	Number of plants	Average output metric (tons)
1965[2]	16.3	5.4	33	230+	23, 176
1971	30.9	12.4	40	1, 800	6, 900
1972	38.0	18.2	48	2, 400	7, 600
1973	40.8	20.4	50	2, 800	7, 300
1974	37.3	21.2	57	2, 800	7, 600
1975	46.9	27.6	59	3, 000	9, 200
1976	49.1	29.5	60	3, 000	9, 900
1977[3]	52.0	33.3	64	3, 000+	11, 000
1978[4]	70.5	47.0	64+	3, 400+	13, 800

[1] Adapted from tables 1 and 2 in Central Intelligence Agency, "China's Cement Industry," ER77-10704, November 1977.
[2] NCNA Dec. 15, 1973, in SCMP 5522, pp. 14–15.
[3] JJYJ (11) 1979, pp. 41–48.
[4] NCNA Dec. 5, 1978, in BBC W1013/A/12.

TABLE 4.—SUMMARY ASSESSMENT OF TECHNOECONOMIC VIABILITY OF THE "FIVE SMALL INDUSTRIES"

Industry	Performance appraisal	Complex technology	State support	Widespread availability of resources	Significant scale economies
Nitrogenous fertilizers	Mixed	Yes	+	Yes	+
Phosphorus fertilizers	Unsuccessful	No	0	No	0
Iron and steel	do	Yes	+	No	+
Farm machinery (I)[1]	Successful	No	+	Yes	0
Farm machinery (II)[2]	Unsuccessful	Yes	+	No	+
Cement	Successful	No	0	Yes	0
Hydroelectricity	do	No	0	Yes	0

[1] This sector refers to plants producing farm implements, manually operated machines and small, simple machines such as grain-milling machines, fodder crushers, electric motors, etc.
[2] This sector refers to plants producing complex power equipment such as hand tractors and diesel engines.

2. AGRICULTURE

CHINA'S AGRICULTURE IN THE EIGHTIES

By Frederic M. Surls and Francis C. Tuan*

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INTRODUCTION

Agriculture, long a weak link in China's economy, has a new and critical role to play in meeting China's evolving commitment to higher standards of living. This commitment is an important underpinning for the claims to legitimacy of the new leadership. It is also crucial to efforts to raise productivity and generate greater economic growth through more reliance on material incentives. The higher real incomes required by this commitment mean substantial new demands on agriculture on top of a backlog of unfulfilled demand accumulated in past years of economic stagnation. Failure to meet these demands will seriously compromise China's current drive for modernization and sustained economic growth.

China's agriculture at the beginning of the eighties appears positioned to grow somewhat faster than historical growth rates, at least through the mid-eighties. But no major breakthroughs in production are imminent. This paper examines the major factors shaping agricultural growth in the eighties and assesses production prospects for major crops and livestock through 1985. It concludes that China's 1985 plan targets for major agricultural commodities can be met, with the notable exception of grain. This would permit modest improvements in per capita consumption of major food items over levels achieved by 1980. But attaining the increases in production that appear possible will require, among other things, continuation of relaxed central government control over agriculture, a direction with which China's leaders are likely to become increasingly uncomfortable.

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The new demands on agriculture should be viewed against a background of sluggish past performance. China's agriculture grew slowly between the mid-fifties and the late seventies. Over this period of more than two decades, per capita agricultural production increased only marginally and much of the gains came in 1978 and 1979 when farm output rose sharply. Per capita grain production in 1977 was only about equal to that of the mid-fifties and availability of edible oils was sharply lower. Supplies of meat, sugar, and fruits were somewhat higher but the overall increase in per capita food production was minimal. Moreover, the agricultural gains that did occur were won with increasingly large expenditures of resources; productivity in agriculture increased slowly, at best.[1]

China's leadership is stressing productivity gains from new policies as the major stimulus to agricultural growth in the eighties. More decentralized decisionmaking, greater reliance on material incentives, and growing specialization and commercialization of agriculture are being counted on to increase the quantity of output that can be produced with available supplies of land, labor, capital, and current inputs such as fertilizer. These policies will have to be successful if growth rates are to rise. Fertilizer supplies during the eighties will be growing less rapidly than in the past and development of mechanization and irrigation will also proceed more slowly.

While per capita agricultural production will rise during the eighties, the modest increases that are likely will be much smaller than the very large increases achieved in the 1978–80 period when implementation of new policies began. The increases that can be reasonably expected may be insufficient to meet the full range of demands on agriculture. A serious shortfall would generate pressure for further changes in agricultural policy and possibly for a reassertion of centralized control over agriculture.

AGRICULTURE SINCE THE MID-FIFTIES

Relatively good official data are available for years prior to 1958—the beginning of the Great Leap Forward—and for 1977 and subsequent years, when the State Statistical Bureau was reestablished and attitudes toward release of data became more open. We have therefore used averages for two periods—1955–57 and 1977–79—to calculate growth rates for major categories of agricultural production. These growth rates are taken as representative historical rates against which plans and prospects for the eighties can be measured.[2] This procedure ignores the variations of performance in intervening years and generates growth rates which may differ markedly from those of shorter subperiods. But it has the virtue of simplicity and is based on years with the best and most complete data.

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[1] The uncertainties involved in using Chinese data are strikingly illustrated in efforts to measure trends in Chinese factor productivity. Anthony M. Tang finds a 21-percent decline in total factor productivity in agriculture between 1957 and 1977. Thomas B. Wiens calculates a 19-percent increase for roughly the same period. See Anthony M. Tang, "Food and Agriculture in China: Trends and Projections, 1952–77 and 2000," Anthony M. Tang and Bruce Stone, "Food Production in the People's Republic of China" (Washington: International Food Policy Research Institute, May 1980) and Thomas B. Wiens, "Technological Change," The Chinese Agricultural Economy, Ed. Randolph Barker and Radha P. Sinha (Boulder, Colo.: Westview Press, forthcoming).

[2] Subsequent references to historical growth rates all refer to the average rate for the 1955–57 to 1977–79 period.

OVERALL AGRICULTURAL DEVELOPMENT

China's broadest measure of overall rural economic performance—gross value of agricultural output (GVAO)—grew at about 2.9 percent annually between 1955–57 and 1977–79. Allowing for population growth of 1.9 percent per year for the same period, per-capita GVAO grew on average by 1.0 percent per year.[3]

While the focus of this paper will be on production of crops and livestock, these have diminished as a share of rural economic activity. Rural industry and sideline occupations, which have been strongly encouraged by Chinese development policy, generate a growing share of rural production and incomes (table 1). The extent of the growth in importance of rural industry is understated by GVAO data, which includes only industrial output of production brigades and teams.[4] Chinese development strategy for the eighties includes continued growth of industry and sideline occupations as well as increased emphasis on non-crop production. This is viewed as essential to job creation, rural income growth, increased availability of consumer goods, and, ultimately, to the socialization of the rural areas.

TABLE 1.—STRUCTURE OF GVAO

[In percent]

	1957	1977–79 average
Crops	80.6	67.4
Forestry	1.7	3.0
Animal husbandry	12.9	13.6
Sidelines occupations	4.3	14.6
Fisheries	.5	1.4
Total	100.0	100.0

Sources: "Nongyeh Jingji Wenti," 1981, No. 3, p. 3; FBIS, Sept. 12, 1979, p. L–14; "Beijing Review," Jan. 28, 1980, p. 20; Chinese officials to USDA Agricultural Economics and Statistics Delegation, October 1980.

CROP PRODUCTION

Production of most major crops grew somewhat faster than population between 1955–57 and 1977–79. A notable exception to this was production of oilseeds (Tables 2–3). Grain, the largest component of the Chinese diet, grew by 2.3 percent per year, which permitted a very gradual growth—0.4 percent annually—of per capita production. Much of this growth actually occurred during the very good harvests of 1978 and 1979, when production increased by a total of 49 million tons—approximately 17 percent. Per capita production in 1977 was only about equal to that of 1956 and 1957.

Although the growth of per capita production was modest, the proportion of preferred foodgrains increased as wheat production grew by 3.7 percent annually, increasing from 13 to 17 percent of total grain production. The share of rice production held at 44 percent of total grain production. Coarse grains remained about one-fourth of total grain production, although corn production grew rapidly at the expense of sorghum and millet. The residual category, consisting of soybeans, tubers, pulses, and other miscellaneous grains, grew slowly and per capita production actually declined.[5]

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[3] Gross value of agricultural output includes the gross value of output of crops, animal husbandry, forestry, sideline occupations, and fisheries. State Statistical Bureau (SSB) data for 1977–79 in constant 1970 prices have been linked with data for 1955–57 in 1949 constant prices. Constant 1970 prices were calculated to be 133.6 percent of 1949 prices using a reported 4.4 percent annual increase for GVAO between 1949 and 1979. The 4.4 percent growth rate was given by Chinese officials to the USDA Economics and Statistics Delegation, October 1980. GVAO data has been taken from various SSB communiques and reports. The population growth rate is based on the population estimates given in table 2.

[4] Industrial production by commune and county-run enterprises is included in figures on gross value of industrial output.

TABLE 2.—TOTAL AND PER CAPITA PRODUCTION, WITH ANNUAL GROWTH RATES, OF MAJOR GRAIN AND OILSEED CROPS, 1955–57 AND 1977–79

	Total production (million tons)		Annual growth rate, 1955–57 to 1977–79 (percent)	Per capita production [1] (kilograms)		Annual growth rate, 1955–57 to 1977–79 (percent)
	1955–57 average	1977–79 average		1955–57 average	1977–79 average	
Total grains [2]	186.557	306.538	+2.3	295.3	320.0	+0.4
Wheat	23.800	52.567	+3.7	37.7	54.9	+1.7
Rice	82.417	136.400	+2.3	130.5	142.4	+.4
Coarse grains [3]	46.081	77.633	+2.4	72.9	81.0	+.5
Corn	21.609	55.133	+4.3	34.2	57.6	+2.4
Sorghum	8.437	7.800	−.3	13.4	8.1	−2.3
Millet	8.037	6.267	−1.1	12.7	6.5	−3.0
Others [4]	34.259	39.938	+.7	54.2	41.7	−1.2
Oilseed crops (USDA) [5]	16.739	16.215	−.1	26.5	16.9	−2.0
Oilseed crops (PRC) [6]	4.640	5.223	+.5	7.3	5.5	−1.3
Soybeans	9.800	7.453	−1.2	15.5	7.8	−3.1
Cottonseed	3.069	4.283	+1.5	4.9	4.5	−.4
Peanuts	2.944	2.362	−1.0	4.7	2.5	−2.8
Rapeseed	.926	1.830	+3.1	1.5	1.9	+1.1
Sunflowerseed	(7)	.278	(7)	(7)	.3	(7)
Sesameseed	.372	.330	−.5	.6	.3	−3.1

[1] The population series (low variant) prepared by the Foreign Demographic Analysis Division, Bureau of the Census, U.S. Department of Commerce, in May 1980 was used to calculate the per capita production figures. The 6 population estimates used are 617,600,000 (1955), 631,000,000 (1956), 646,500,000 (1957), 945,200,000 (1977), 958,100,000 (1978), and 970 600,000 (1979). All figures are on an end of year basis.

[2] Includes rice, wheat, coarse grains, other miscellaneous grains, pulses, soybeans, and tubers (converted to a grain equivalent weight using a 5 to 1 conversion ratio).

[3] Consists of corn, barley, oats, millet, and sorghum.

[4] Excludes wheat, rice, and coarse grains, but includes soybeans.

[5] Consists of soybeans, cottonseed, peanuts, rapeseed, and sunflowerseed.

[6] Includes peanuts, rapeseed, sesameseed, sunflowerseed, and other oilseeds, mainly linseed and castorbean. Data are available only for the first 3 items for 1955–57. The total for this period is the authors' estimate.

[7] Not available.

Sources: State Statistical Bureau, "Ten Great Years" (Peking: Foreign Language Press, 1960); U.S. Department of Agriculture, Economic and Statistical Service, "People's Republic of China Agricultural Situation: Review of 1980 and Outlook for 1981" and other issues of this annual report.

Modest gains are evident for most other crops—sugar crops and fruit in particular. The decline in oilseed crops is particularly striking, however, as total production showed no increase and per capita output dropped at an average annual rate of 2 percent. Very rapid growth of oilseed production in 1978 and 1979—an 18 percent increase between 1977 and 1979—prevented the decline from being even greater. The growing importance of higher oil content oilseeds, particularly rapeseed and sunflowerseed, and China's shift from a net export to a net import position in soybeans also limited the decline in per capita edible oil availability to less than 1 percent per year. Nonetheless, per capita oil availability by the late seventies was 17 percent below that of the

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[5] Although soybeans are counted as a grain in official Chinese statistics, they are treated as an oilseed in the following discussion. The slow growth of the residual may be partly statistical, because of more complete enumeration of grain by type in the seventies.

TABLE 3.—TOTAL AND PER CAPITA PRODUCTION, WITH ANNUAL GROWTH RATES, OF OTHER CROPS, 1955–57 AND 1977–79

	Total production (million tons)		Annual growth rate, 1955–57 to 1977–79 (percent)	Per capita production [1] (kilograms)		Annual growth rate, 1955–57 to 1977–79 (percent)
	1955–57 average	1977–79 average		1955–57 average	1977–79 average	
Crops						
Cotton	1.535	2.141	+1.5	2.4	2.2	−0.4
Sugarcane	9.060	20.126	+3.7	14.3	21.0	+1.8
Sugar beets	1.584	2.755	+2.5	2.5	2.9	+.6
Sugar	.796	2.194	+4.7	1.3	2.3	+2.8
Edible oil [2]	1.773	2.314	+1.2	2.8	2.4	−.7
Tea	.113	.266	+4.0	.2	.3	+2.0
Tobacco	.458	.912	+3.2	.7	1.0	+1.6
Fruit	2.968	([3] [4])	([4])	4.7	([3] [4])	([4])

[1] Based on the same population series used in table 2.

[2] Estimated from available oilseed data using assumed crush and extraction rates.

[3] Fruit production was 7,250,000 tons in 1979 (FBIS, Dec. 3, 1979, p. L–16). This gives a 1979 per capita figure of 7.5 kg. Data are unavailable for 1977 and 1978.

[4] Not available.

Sources: State Statistical Bureau, "Ten Great Years," (Peking: Foreign Language Press, 1960); U.S. Department of of Agricultural, Economic and Statistical Service, "People's Republic of China Agricultural Situation: Review of 1980 and Outlook or 1981" and other issues of this annual report.

mid-fifties and ranked very low by comparison with other countries. Cotton production also lagged behind population growth.

While the national average picture is one of small overall gains, problems of regional and local food shortages remain. Grain production in some provinces is well below the national average. For example, production per capita in the southwestern provinces of Guizhou and Yunnan was only about 70 percent of the national average in the late seventies. A number of the northwestern provinces are also well below average.[6] Even in the more productive provinces there is considerable disparity between regions. The poorer regions of the country face tight food supplies even in good years and find themselves very hard pressed in years of poor harvests. Central government resources are inadequate to eliminate local disparities.

LIVESTOCK

The hog is the most important animal in China's livestock sector. Pork provides the bulk of meat production, and exports of live hogs, pork and hog products have been an important part of agricultural exports. Over the past 25 years hogs have received the greatest attention and emphasis; yearend inventory numbers increased at an annual rate of 4.9 percent per year between 1955–57 and 1977–79 (table 4).

Sheep and goat numbers grew at a more moderate rate of 2.9 percent per year over the same period. However, inventory numbers rose by 14 percent between 1977 and 1979 as milk goat production was promoted as a potential new source of dairy products.

Large animal numbers showed the least development in the livestock sector. Cattle, the largest component of the large animal category, are used mainly for draft purposes. The mechanization of agriculture limited growth of demand for draft animals between the mid-fifties and late seventies. However, a recent slowdown in the mechanization program and efforts to promote ruminant-type animal production in pastoral areas for meat and animal products led to a small increase in the growth of cattle numbers in the late seventies.

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[6] Based on provincial production data presented in Francis C. Tuan, "PRC Provincial Total Grain Production, 1969–79," Staff Report, Econ. and Stat. Serv., U.S. Dept. Agr., January 1981.

TABLE 4.—YEAREND LIVESTOCK INVENTORY, MEAT PRODUCTION, AND ANNUAL GROWTH RATES, 1955–57 AND 1977–79

	1955–57 average	1977–79 average	Annual growth rate, 1955–57 to 1977–79 (percent)
Livestock inventory (million head): [1]			
Hogs	105.947	304.258	+4.9
Sheep and goats	91.485	171.481	+2.9
Large animals	86.072	94.077	+.4
Of which, cattle	65.388	70.803	+.4
Total meat (million tons) [2]	(5)	8.861	[3] +3.7
Per capita meat production (kilograms)	(5)	9.2	[4] +1.9

[1] Before 1957, reported inventory numbers were as of midyear.

[2] Includes pork, beef, and mutton.

[3] Calculation based on the reported 1957 meat production of 3,985,000 tons.

[4] Calculation based on 1957 per capita meat production of 6.1 kg. The population series used for calculating per capita production is the same series used in tables 2 and 3.

[5] Not available.

Sources: Data for 1957 and 1977–79 are from State Statistical Bureau, "Main Indicators, Development of the National Economy of the People's Republic of China (1947–1979)" (Beijing, 1980). Data from 1955 and 1956 are from Nai-ruenn Chen, "Chinese Economic Statistics" (Chicago: Aldine Publishing Co., 1967), p. 340.

Meat production figures reported by China consist of pork, beef, and mutton (table 4). Pork is the dominant part of meat production, providing more than 90 percent of the total. The 3.7 percent annual growth of meat production has been signficantly slower than that of hog numbers. This cannot be fully explained by slow growth of beef and mutton production. Apparently emphasis on hog inventory numbers for evaluating farm performance contributed to excessively slow turnover of hogs and growing inefficiency in meat production. For example, the hog slaughter rate in China was reported to be less than 60 percent in the late seventies while that of the United States was about 150 percent. As a result, China produced roughly 10 million tons of pork in 1979 with a 1978 yearend inventory of over 300 million head of hogs. In contrast, in the United States 7 million tons of pork were produced in the same year from an inventory of about 60 million head, one-fifth of China's total.

China's per capita meat production of 9.2 kg. (1977–79 average) is low, especially when compared with developed countries such as the United States. U.S. per capita meat production for the same period was 81 kg., nearly 8 times China's level. Inclusion of poultry does not change the picture significantly. Hard data are unavailable, but meat from poultry was only about 1 kg. per capita in the late seventies.

AGRICULTURAL POLICY

Since 1977, China's approach to accelerating the growth of agricultural production has hinged on a new mix of policy measures, increases in inputs, and some increase in resources devoted to agricultural technology. While "agriculture first" is a key slogan, the top priority for agriculture is most evident in the rhetoric of the leadership. Large increases in central government allocations of resources for agriculture have not occurred. During the eighties the pace of growth of inputs is likely to slow compared to that of the seventies, and new policies and organizational changes are being counted on to generate a large share of increased production. Many of the specifics of new agricultural policies are still evolving and substantial further modifications are likely. The modifications underway are significant; but it is important to remember that fundamental rural institutions and policies such as the commune system, collective ownership, a strong role for the central government in agricultural planning, and a state monopoly on purchase of major agricultural products, are still in place. Changes thus far are for the most part only marginal adjustments to these basic features.

New policies are directed at the entire range of past rural problems—stagnant rural living standards, onesided emphasis on grain production and neglect of cash crops, forestry and livestock, and a low rate of off-farm sales of major agricultural products, particularly grain. But the main focus of policy change is raising the rate of growth of agricultural production by increasing efficiency—increasing the quantity of farm products that can be produced with available supplies of inputs. China's leadership appears to feel that agriculture in the past was so riddled with inefficiency that new policies in and of themselves will yield substantial increases in output during the next several years. In this view, for example, land can shift from grain to other uses with no reduction in grain output as more efficient use of remaining grain area raises yields enough to offset the loss in area. Over the longer-run, these policy changes, some increase in resources for agriculture, and accelerated technological progress are expected to sustain agricultural growth.

The main thrust of modifications in agricultural policy to date focus on 3 areas: (1) decentralization of control and diversification of production, (2) new emphasis on incentives and greater use of the price mechanism, and (3) greater commercialization of agriculture. These are closely related, as decentralization and diversification require better incentives, an improved price system, and expanded marketing of farm products.

DECENTRALIZATION AND DIVERSIFICATION

Excessive central government control over agriculture together with one-sided emphasis on grain production have been an important source of inefficiency in agriculture. Centralization of control over basic-level agricultural decisions has led to excessive double and triple cropping in some areas, marginal lands shifted from grassland or other uses to grain production, and neglect of non-grain crops. For example, because of stress laid on grain production, cotton in the North China Plain was scattered across wide areas, planting was generally on poorer soils, and labor and other resources were diverted from cotton to grain. By the late seventies, cotton area in northern China was down 8 percent from 1973 (33 percent below area in 1957) and yields were 26 percent below those of the peak year of 1973.[7] In central and southern China, excessive emphasis on fulfilling grain area and production targets led to expansion of double cropped rice in areas where available supplies of labor, water, and irrigation made this inappropriate.[8] In marginal areas of the northeast and northwest, shifting grasslands and forests into grain led to increased erosion and soil destruction. Policy-induced changes in land use were in part responsible for the slow growth of production of non-grain crops and other agricultural activities, stagnant income, and slow growth of overall rural productivity while adding little to the long-run growth of grain production.

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[7] Based on data from Frederic M. Surls, "China's Cotton Area, Yield and Production by Province: A Partial Data Set," Staff Report, Econ. and Stat. Serv., U.S. Dept. Agr., October 1980 and from Renmin Ribao (hereafter cited as RmRb), June 5, 1979, p. 2.

Policies adopted since 1977 have in part aimed at passing increased decisionmaking authority from the central government down to lower levels in an effort to reduce the rigidities of centralized control and promote increased diversity in agricultural production.[9] Changes have affected all levels of China's system. Provinces have apparently been given a more active role in agricultural planning and decisionmaking. Soil and land use surveys are in progress and a crude form of agricultural zoning is now underway. Nei Monggol, for example, has identified livestock as the top priority and has reduced grain area, returning some acreage to grasslands and forestry. At the same time, regions in the province which will continue to emphasize grain production have been identified.[10] Similar efforts to diversify production and encourage localities to emphasize crops best suited to local conditions are evident in other provinces as well. These changes are gradual. In many cases they are likely no more than a return to traditional land uses and cropping systems. But they do represent an effort to raise the concentration of production of cash crops as well as return land poorly suited for grain production to other uses.

The role of China's more than 2,100 counties in agricultural planning is also increasing. County-level planners, who once served largely as a conduit for detailed plans, will now take broad targets (such as total grain, cotton, oilseed, or sugar production) which are passed down from the province and negotiate more specific targets with communes, production brigades and production teams. How far these changes have in fact gone thus far is not clear. But the intention is clearly to allow production decisions to be based on local conditions and production possibilities, while preserving central government control over national production totals.[11]

At the local level, production teams have been given increased autonomy.[12] Past emphasis on gradually eliminating the role and importance of the team in the commune system has been down-played. China's new constitution reaffirms the role of the team as the basic unit in rural areas. Efforts have been made to bolster protection for the team against confiscation of land, conscription of labor, and unreasonable interference with team operations.

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[8] See the article by Thomas B. Wiens in this volume.

[9] Policy change in the period from 1977 onward has been a process of ongoing evolution. No attempt is made here to describe these changes over time. Rather the focus is on describing the general direction of changes and the status of policy as of early 1981. More details on the specifics of policy measures and references to major documents can be found in U.S. Dept. Agr., Econ., and Stat. Serv., People's Republic of China Agricultural Situation: Review of 1977 and Outlook for 1978, Supplement 6 to WAS–15, May 1978, pp. 3–8 and in subsequent annual issues of this report (these reports are hereafter cited as PRC Agricultural Situation Report).

[10] Foreign Broadcast Information Service, Daily Report: People's Republic of China, (hereafter cited as FBIS), Apr. 9, 1981, p. R–3.

[11] An extensive discussion of changes underway in agricultural planning can be found in U.S. Dept. of Agr., Econ. Res. Serv., "China's Agricultural Planning and Statistical System: Trip Report of the USDA Agricultural Economics and Statistics Delegation" (forthcoming).

[12] Production teams are the basic decisionmaking unit of China's communes. For a full discussion of the commune system, see Frederick W. Crook, "The Commune Systems in the People's Republic of China: 1963–74," Joint Economic Committee, "China: A Reassessment of the Economy" (Washington: U.S. Government Printing Office, July 10, 1975).

Of more direct importance, tight controls over team decisions have eased and stress has shifted to basing planting on local conditions. In 1980, acreage targets for grains were apparently lifted, as were production targets for individual grains. Targets for total grain production and for sales to the government (procurement targets) were retained. Production teams were thus left with greater freedom to select their own mix of grain crops and some choice as to allocation of land between grain and other crops. This is an incomplete relaxation of controls over team decisions, however. Acreage targets have been retained for major cash crops and the government is still in a strong position to exert pressure on planting decisions through procurement targets and purchase contracts. But the degree of local flexibility has increased. One strong indication of reduced direct central government influence over planting is the substantial drop in rice area over the past several years as teams have shifted away from double cropping to more traditional and presumably more profitable planting patterns. The central government's concern about cutbacks in grain area and apparently unsuccessful efforts to prevent further reduction in grain area in 1981 are also indications of reduced central control.

Less restriction on private plots and household sideline activities is a final element of government encouragement of diversification. These are an important source of supplementary food and cash income for rural households. The majority of hogs and poultry are also raised by households. Private plots and household sidelines have in the past been viewed with suspicion and in some periods sharply restricted, as they draw labor and other resources away from collective production.

Over the past several years, however, private activities have grown rapidly with substantial government encouragement. A 1979 survey of over 10,000 farm households found private plots and private production accounting for 26 percent of 1979 rural household income in the households surveyed.[13] Once restricted to 5 percent of farm land, private plots will now be permitted to increase to a maximum of 15 percent of farmland. Additionally, except for peak seasons, a portion of the rural labor force can now be excused from collective production to engage in household production and work on private plots.[14] Expanded scope for private activity has been accompanied by reopening, expanding, and reducing controls on rural markets, opening new marketing channels for private production. Along with other changes, private plots are growing in importance as sources of feedgrains and are a major stimulus to greater household production of livestock and speciality crops.[15]

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[13] U.S. Joint Pub. Res. Serv., China Report: Agriculture (hereafter cited as JPRS/Ag.), No. 77200, 19 Jan. 1981, pp. 1–4.

[14] Beijing Review, 29 June 1981, pp. 3–4.

[15] Scattered provincial reports indicate that significant amounts of grain are being produced on private plots. In 1980, for example, 12.5 percent of grain production in Gansu province came from the private plots (FBIS, 8 May 1981, p. T–1 and Survey of World Broadcasts, The Far East Weekly Economic Report, 7 Jan. 1981, p. A–10). Data from provincial officials in Jiangsu indicates that in 1979, 3 percent of total grain production and nearly 16 percent of miscellaneous grains were from the private plots.

These adjustments in planning and control over production teams and households are an important part of efforts to diversify production and raise productivity in agriculture. Looser restrictions on private plots and sideline activity also appear aimed at aiding poorer production teams and households. The greatest increases in private plot area are likely to occur in relatively backward and low income regions.

GREATER INCENTIVES AND AN IMPROVED PRICE SYSTEM

In a centrally planned economy such as China's, farm and retail prices for major commodities are centrally set and only infrequently adjusted. Still, prices paid by the government for farm products have a major impact on income. Additionally, to the extent production teams are not totally tied down by plans set by higher levels, prices received by producers influence the relative profitability of crops and therefore production decisions.

To raise rural incomes and also to stimulate production, China's leadership undertook a major revision of prices paid for farm products in March 1979.[16] Prices for 18 categories of agricultural products were raised at that time. The new average quota procurement prices for major categories, taking the 1978 quota price as 100, were as follows (price for above-quota sales compared with 1978 quota procurement price in parentheses):

	1978	1979
Grains	100	120 (180)
Oilseeds	100	125 (188)
Cotton	100	115 (150)
Hogs	100	126 (NA)

Price increases for other categories ranged from 20 to 50 percent.[17] These prices increases were partially responsible for the 16 percent increase in per capita distributions by communes beween 1978 and 1980.[18] Procurement price increases were not passed on to the retail level, with the exception of retail price increases in November 1979 primarily for livestock products. The resulting deficit for government commercial organs was covered with increased budget subsidies.

In the new environment of greater local autonomy, the higher prices for cash crops contributed to a shift of area away from grain to cash crops such as cotton, oilseeds, and sugar and to improved cash crop yields. In the case of cotton, the quota price was increased by an additional 10 percent in 1980 when production showed only a small increase in 1979. The greater attractiveness of cash crops also appears to have resulted in their being planted on better land and given more inputs and better care. This was an important cause of yield increases in 1979 and 1980. Cotton provides the most striking example of responses to improved incentives. Yields in northern China, traditionally the major cotton region, rose by 81 percent in 1980, largely because of the incentive measures implemented in 1979 and 1980.

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[16] With limited exceptions the government is the sole buyer of major agricultural products from producing units and is also the primary wholesaler and retailer of raw and processed agricultural products. Compulsory sales to the government consist of (1) quota sales, the amount of which is fixed for several years at a time on the basis of historical average production and (2) above-quota sales, additional amounts which are fixed annually on the basis of anticipated production. The first category carries a fixed and relatively low purchase price—the quota price. Above quota sales carry a higher state-set price—the above quota price. Additional sales over and above the above-quota amounts may be made at prices negotiated with the government procurement agency.

[17] RmRb. Oct. 25, 1979, p. 1.

[18] Based on per capita distribution figures reported in the 1979 and 1980 SSB communiques (FBIS, Apr. 30, 1980, p. L–9 and Apr. 29, 1981, p. K–15).

Although important, higher quota purchase prices per se are insufficient to completely explain the sharp increase in production of cash crops in the last several years. The entire incentive package is shaped by the portion of the crop that is eligible for higher above-quota prices, by bonus fertilizer supplies, by return of part of the processed product to the producing unit, and by government guarantees of food grain supplies for teams which specialize in cash crop production. The guarantee of grain supplies is particularly important. Past efforts to stimulate cash crop production failed when the government did not deliver needed food supplies. Peasants had to continue to stress grain production in self-defense. In the last several years, more state grain has apparently been set aside and made available to cash crop producers.

Another feature of new incentive programs is responsibility and payment systems which tie income more directly to effort. Egalitarianism was a main feature of rural income distribution systems during the Cultural Revolution, with income to a substantial degree separated from productive effort. At present a great deal of experimentation is underway with systems to tie pay to performance. The main thrust of these efforts is to separate production responsibilities and assign them to small units within the production team. Distribution of income by the team can then be more easily based on performance. New responsibility systems generally involve contracting for certain jobs with small work groups, households, or individuals.[19] In some cases these efforts have also included breaking up production teams into a number of small teams. These efforts are controversial; extreme proposals have even included the dissolution of the commune systems.[20] Many of the systems under discussion and experimentation involve a strong role for private effort and are a potential challenge to collective ownership and operation of China's agricultural system. But they reflect a clearly perceived need to increase work incentives as a means of stimulating productivity growth in agriculture. As is the case with liberalization of private plots, some of the most drastic experiments are taking place in poorer areas in an effort to raise incomes in the most backward rural areas.

COMMERCIALIZATION

Growth of light industry, growing food needs in urban areas, and increasing agricultural specialization all imply a need for more commercialization of agriculture, as local self-sufficiency gives way to more interdependency between regions. Greater and guaranteed government supplies of food, particularly grain, are critical for regional specialization of agricultural production. Failure to provide these supplies has been a major block to past attempts to promote specialization.

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[19] See, for example, FBIS, Nov. 7, 1980, pp. L–21 to 29.
[20] FBIS, Mar. 12, 1981, p. L–20.

Current marketing rates for farm products vary greatly. The proportion of production sold rather than being retained for on-farm consumption and use was recently reported as (in percent):[21]

Grains	20
Oilseeds	55
Pork	65
Cotton	98
Other cash crops	85

The proportion of grain production moving into marketing channels is now even less than during the fifties, when an average of about 27 percent of the crop was turned over to the government.[22] The marketed share has not increased with recent increases in production and higher prices paid for grain. Between 1977 and 1979 state grain procurements rose by only 8 million tons despite a nearly 50 million ton rise in production.[23]

A greater share of grain production will have to be procured if government requirements are to be met. One major effort is government support for development of commercial grain bases. These are areas that are expected to market a large share of increases in production. They are receiving government assistance in the form of fertilizer, machinery, and other aid. Twelve major base areas have been identified by the Chinese. Special emphasis is now being placed on base areas in the Northeast, particularly Heilongjiang, where mechanization together with land that can be opened to cultivation is felt to offer large potential for generating additional grain supplies for government needs.

The predominance of state farms in many of the regions singled out for development as grain bases means a growing importance for the state farm sector. Although state farms account for only about 5 percent of cultivated area, they already market over 30 percent of their grain production and offer a high potential return of additional marketed grain to state investment.

The developments in agricultural policy outlined here promise more incentives and greater efficiency, more balanced production, and greater commercialization. If continued, they will have a positive effect on the rate of growth of Chinese agriculture. But changes in policy and economic environment are only one part of the set of factors determining agricultural growth. Increases in resources devoted to agriculture will also play an important role in determining the success of China's agricultural plans for the eighties.

AGRICULTURAL INPUTS

Agricultural policy sets the environment in which production occurs and influences the extent to which production potentials can be realized. But the capacity to produce is ultimately determined by the supplies of inputs available to the farm sector—land, labor, fertilizers and agricultural chemicals, water, machinery, and technology—and by the efficiency with which these are combined. Over the past tweny-five years the availability of modern inputs, particularly fertilizer and power irrigation, has increased at a rapid rate (table 5). This growth, together with technological progress such as the development and introduction of new varieties, has made a critical contribution to the growth of production and to the modernization of China's agriculture.[24]

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[21] RmRb, Apr. 9, 1981, p. 5 for all crops except cotton. The cotton figure is from RmRb, June 26, 1981, p. 1.

[22] This is the 1955–57 average calculated from David L. Denny, "Rural Policies and the Distribution of Agricultural Products in China: 1950–59," unpublished Ph.D. dissertion, University of Michigan, 1971, p. 24.

[23] RmRb, Aug. 30, 1980, p. 1.

Supplies of many of these inputs in coming years are likely to grow more slowly than in the past, raising questions about China's ability to accelerate agricultural development even with a shift to more effective policies. Moreover, as important as greater physical quantities of inputs will be, of equal importance is China's ability to package them effectively—improved seeds must be coupled with the proper types and quantities of fertilizer and with timely irrigation and field management. This in turn will require growth of managerial skills and technological expertise at the farm level.

TABLE 5.—GROWTH OF AGRICULTURAL INPUTS, 1955–57 TO 1977–79

	Unit	1955–57 average	1977–79 average	Annual growth rate, 1955–57 to 1977–79 (percent)
Cultivated area [1]	Million hectare	111.3	99.0	−0.5
Multiple crop index [1]		140.0	150.0	.3
Chemical fertilizer [2]	Million ton	.1	8.9	22.6
Chemical insecticides [3]	Thousand ton	65.0	509.0	9.8
Irrigated area [1]	Million hectare	30.4	46.7	2.0
Power irrigation and drainage [3]	Million horsepower	.6	65.6	24.1
Large and medium tractors	Thousand	14.7	563.7	18.0
Hand tractors	Thousand	(4)	1,378.3	(4)
Machine plowed land [3]	Percent	2.4	40.7	13.7
Rural electric consumption	Billion kilowatts	.1	25.3	26.6

[1] Average for 1977–79 is an approximation since data is missing for 1 or more years.
[2] Figures in nutrient weights.
[3] Data missing for 1955 and 1956; average is 1957 figure.
[4] Not available.

Sources: U.S. Department of Agriculture, Economics and Statistics Service, "Agricultural Situation: People's Republic of China, Review of 1980 and Outlook for 1981, "Supplement 6 to WAS–24, June 1981. U.S. Department of Agriculture, Economic Research Service, "China's Agricultural Planning and Statistical System: Trip Report of the USDA Agricultural Economics and Statistics Delegation," (forthcoming). State Statistical Bureau, various annual reports.

ACREAGE

Cultivated area declined by 12 million hectares—over 10 percent—during the last two decades. During this period, a total of 33 million hectares were removed from cultivation either because of destruction by salinization and erosion or for industrial use, housing, roads, and other purposes. Much of the lost acreage has been prime farmland. A total of 21 million hectares of new land has been brought under cultivation. Much of the reclaimed land was of poorer quality than that removed from cultivation.[25]

The reduction in cultivated area has been partially offset by greater multiple cropping, e.g. through more use of previously fallow fields for overwintering crops such as wheat and rapeseed, more double cropping of rice, and greater intercropping. Nonetheless, sown area of crops has declined by about 5 percent over the past two decades.

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[24] Major historical developments for input supplies and technology are covered in detail in Henry J. Groen and James A. Kilpatrick, "Chinese Agricultural Production," and Thomas B. Wiens, "The Evolution of Policy Capabilities in China's Agricultural Technology," Joint Economic Committee, "Chinese Economy Post-Mao" (Washington: U.S. Government Printing Office, November 1978).

[25] RmRb, Apr. 29, 1980, p. 2.

Additional acreage for crops during the eighties can come from either land reclamation or more multiple cropping. Current plans call for reclamation of 8 million hectares—8 percent of current cultivated area—by 1985. A major share of this is to be in the Northeast, which has the largest reserve of undeveloped land.[26] Much of this development will be costly, technically difficult, and a strain on the state budget and available expertise. Because of these problems, reclamation will likely fall short of the target and foreign assistance is now being sought for the largest reclamation project—the Sanjiang Plan project in Heilongjiang.[27]

Despite heightened government concern about land use and loss of prime farmland, acreage will continue to shift to industrial and urban uses. Additionally, some land now under crops will continue to be shifted to forestry and non-crop agricultural use. China seems unlikely to reverse the decline in cultivated area.

Increases in sown area through multiple cropping will also be difficult to achieve. Some regions are reducing multiple cropping when it is uneconomical. New lands in the Northeast are predominantly single crop regions. Hence, very little increase in the multiple crop index is likely during the eighties. With no increase in either cultivated area of multiple cropping, increases in crop production will have to come exclusively from higher yields.

FERTILIZER

Organic fertilizer has historically been the largest source of plant nutrients in China. As late as the mid-seventies organic sources may have provided as much as three-fourths of total nutrient supplies.[28] However, growing chemical fertilizer use has provided the major source of growth of nutrient supplies. The most rapid growth of fertilizer use occurred in the late seventies when average fertilizer application per hectare of cultivated land doubled between 1977 and 1980.[29] This rapid growth of nutrient availabilities was likely the single most important reason for the sharp rise in grain yields in the late seventies.

Chemical fertilizer will continue to be critical to growth of Chinese crop yields. The rapid growth of domestic fertilizer production during the latter half of the seventies will not be repeated in the eighties. Much of the growth of production in the seventies was the result of 13 large imported nitrogen fertilizer plants contracted for in 1973 and 1974. As these plants came onstream in the late seventies, nitrogen fertilizer production capacity approximately doubled. No comparable gains are in sight for the eighties. Although at one time plans called for 1 large plant per province by 1985, this goal has apparently been shelved and additional construction of large nitrogen plants is proceeding at a slow pace. In addition, China's small-scale local fertilizer industry, which until recently produced over half of all fertilizer, is being trimmed. Inefficient and high-cost plants are being closed as part of the industrial retrenchment program. Thus, annual production will grow at a rate considerably below the historical growth rate of 23 percent per year (table 5).

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[26] JPRS/Ag., No. 73389, May 7, 1979, pp. 24 and 34. An earlier plan target of 13 million hectares has been dropped.

[27] "Agricultural Development of the Three Rivers Plain," China Newsletter, No. 30, February 1981, pp. 20–24.

[28] Based on estimates of organic fertilizer use cited in Tang and Stone, p. 61.

[29] Based on fertilizer application rates reported in various annual SSB communiques on plan fulfillment.

Balance in fertilizer production is becoming more important. Domestic fertilizer production is predominantly nitrogen. The proportions of nitrogen, phosphorous, and potassium in total 1980 production were .81, .19, and .002 respectively. Organic fertilizer provides relatively large amounts of phosphorous and potassium. But with increased nitrogen use, shortages of phosphorous and potassium have become limiting factors in fertilizer effectiveness in some areas. Efforts have been made to accelerate development of domestic phosphate and potassium resources and production. A large potassium plant is now under construction in Qinghai, the location of China's largest potassium reserves. Successful development of supplies of these nutrients could increase the effectiveness of available nitrogen supplies and partially counteract a slowdown in the growth of nitrogen production.

More effective application of fertilizer and better handling technology can also partially offset a slowdown in the growth of total production. Production from the small-scale plants is volatile and a substantial amount of nutrients are lost. Better bagging and storage together with improved application techniques could increase effective nutrient supply. Improved field management and control over timing and application mix and quantities are also important.

More balanced fertilizer production together with improved efficiency of use will offset some of the impact on agricultural production of the slowdown of growth of domestic fertilizer production. But fertilizer availability may prove a constraint on production growth in the eighties, and China is likely to increase imports of fertilizer, particularly phosphorous, potassium, and compound fertilizers.

IRRIGATION AND WATER CONTROL

Expanded irrigation and water control have made a major contribution to the growth of agricultural production. Irrigated area at the end of the seventies was 53 percent greater than in the mid-fifties and covered nearly 50 percent of China's cultivated area.[30] This is only one measure of improvements in water control. Already-existing irrigation facilities have been upgraded and drainage facilities expanded. Improved and expanded irrigation has made it possible for China to capitalize on the yield potential of new high yielding varieties and on increased fertilizer production.

Irrigation facilities were already in place during the fifties in many of the provinces of central and southern China. The greatest expansion of irrigation over the last 25 years was in the North China Plain, where tubewell irrigation systems made possible increased wheat cultivation, greater yields, and rising per capita grain production. Normal rainfall in this area is not adequate to insure good crops in normal years and most precipitation falls during the summer. Rainfall during the main growth periods of overwintering crops such as wheat is sparse and insufficient for good production, particularly with newer high yielding varieties which require ample supplies of water and fertilizer.

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[30] The data on irrigated area should be viewed with caution. The quality of irrigation systems varies considerably and the definition of irrigated area may have been upgraded over the past 25 years.

Although continued expansion and improvement of irrigation and water control is important to future growth of Chinese agriculture, the current approach to development of these systems is a cautious one. At least for the duration of the readjustment period, China appears to be focusing on quality and a carefully considered balancing of costs and expected benefits in choosing new projects. Most projects undertaken are likely to be low cost and small scale improvements of existing systems. Large capital intensive projects such as the long-discussed Yangtze River diversion plan have been delayed. This program, which would extend irrigated acreage in the North China Plain by northward diversion of water from the Yangtze, may ultimately prove necessary and feasible. But there is now clear recognition of the high costs and environmental problems that could result and implementation of the program has been postponed, although planning continues.[31]

Some caution about expanding irrigation is justified. Further expansion will encounter rising costs. Areas of northern China are finding irrigation supplies from shallow wells depleted during periods of extended drought. In some areas, particularly in and around Beijing and Tianjin, competition for water between agriculture and other uses is severe and heavy use is causing water tables to drop as well as threatening contamination of water supplies. Improper irrigation in the past has caused salinzation and reduced productivity of land.

China may well derive substantial returns over the next several years by focusing on low-cost improvements in existing irrigation and water control systems and from making more efficient use of existing irrigation supplies. But over the longer-term, costly large-scale projects such as the Yangtze diversion may be necessary. Nearly half of the drought-prone North China Plain is still unirrigated. Waterlogging of soils is still a serious problem over wide areas and will ultimately require improved and expanded drainage facilities. Through the mid-eighties, however, no major expansion of irrigated area is likely.

MECHANIZATION

Mechanization of Chinese agriculture has been important but progress has been uneven, with rapid advances in some areas but very little progress in others. The general pattern of mechanization fits China's abundance of labor and scarcity of land. In general, mechanization has expanded most rapidly in areas where it has a direct and substantial impact on yields. The rapid expansion of power irrigation and drainage equipment during the past 25 years is a clear example of this pattern (table 5). By the late seventies, power irrigation and drainage equipment accounted for about 40 percent of the total horsepower of agricultural machinery in China.[32]

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[31] See, for example, FBIS, Nov. 4, 1980, p. L-5.
[32] JPRS/Ag. No. 78263, June 10, 1981, p. 20.

Mechanization of field operations, the hallmark of mechanization in an extensive agriculture such as that of the U.S., has been more gradual and selective. Tractors and related field equipment now account for only about one-fourth of total horsepower of agricultural machinery. Greatest progress has been made in field preparation; 42 percent of cultivated area is reportedly machine-plowed at present. Progress has been slower in other facets of field work. Only about 10 percent of sown area is now machine seeded and the percentage of area harvested by machinery is even lower—2.6 percent in the late seventies.[33]

The greatest mechanization of field work has occurred where field size is relatively large and population is sparse by China's standards. Under these circumstances, mechanization can speed field preparation, an important factor where the growing season is short, and presents a relatively small threat of generating rural unemployment. The Northeast is the clearest example of favorable circumstances for extensive mechanization. Here, 57 percent of area is machine-plowed, the proportion of area sown by machine is triple the national average, and 11.5 percent of area is mechanically harvested.[34]

Mechanization of field work has proceeded more slowly in other regions. In central and southern China, fields tend to be small, soils are heavy, and intercropping is common.[35] This increases the complexity of mechanization and has made for very slow progress in replacing human and animal power with machinery. Hand tractors, which have grown rapidly in numbers, are potentially suited for use in these areas but are still largely used for rural transportation. Mechanized rice transplanters, often written about and photographed but seldom seen in use, are apparently not capable of effectively transplanting rice.

Further mechanization of field work in China's traditional agricultural areas does offer the prospect of higher production. Multiple cropping requires rapid turnaround if crops are to fit the seasons. Delays of several days may seriously impair yields. Labor requirements during these periods can be extremely high and selective mechanization can supplement seasonal labor shortages. The problems with expanding the use of small tractors in these areas apparently center about unreliability, failure of producers to make complete sets of equipment available, and probably also urgent need for transportation equipment at the same time. More success has thus far been achieved in freeing labor through mechanization of grain and feed processing.

Agricultural development plans adopted in 1977 and 1978 emphasized comprehensive rapid mechanization of agriculture as the cornerstone of agricultural development. The 10-year development plan adopted at this time called for 70 percent basic mechanization of agriculture by 1980 and mechanization of all major farm processes to be 85 percent complete by 1985.[36] More recently, emphasis has shifted to a more pragmatic and less categorical approach to mechanization. The new approach realizes that mechanization per se is not necessarily desirable or feasible, for example when it displaces labor which has little in the way of available alternative employment opportunities. Under the current approach, the level of mechanization is no longer a criterion for judging success in mechanization. The suitability of mechanization is to be judged according to local circumstances and by its impact on yields, farm marketings, and rural incomes.[37] Major central government support for mechanization is now being concentrated on the Northeast, particularly in the commodity grain bases where a high payoff in the form of greater marketings is expected.

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[33] Ibid.

[34] RmRb, Sept. 24, 1980, p. 2.

[35] For example, crops such as cotton are started in spring between rows of maturing wheat. Hand harvesting of wheat is then necessary.

[36] The evolution of policy in the late seventies is surveyed in annual issues of PRC Agricultural Situation Report. Mechanization has been a controversial issue since the fifties. An extensive discussion of this is given in Benedict Stavis, "The Politics of Agricultural Mechanization in China" (Ithaca, N.Y.: Cornell University Press, 1978).

During the eighties, overall progress in mechanization will very likely slow, but mechanization will show greater cost-effectiveness. Mechanization of irrigation will continue. Reduced demand for large and medium tractors is already apparent as state pressure for meeting mechanization targets has eased and production of these items will grow at a slower pace than in the past. More careful consideration of mechanization is also important from the standpoint of energy. Farm machinery now consumes 40 percent of China's diesel fuel; slowing the growth of rural energy consumption can help ease China's energy shortages.[38]

AGRICULTURAL RESEARCH

Technological progress will play a critical role in the future growth of China's agriculture. The peculiarities of China's cropping systems and natural resources suggests that opportunities for direct application of foreign agricultural technology are limited. Technological progress will have to be in large part internally generated.

Many facets of Chinese agriculture are already sophisticated and the PRC has made major technological advances in crop production, particularly in rice, wheat, and intensive farming systems. But the Cultural Revolution left a legacy of a weakened basic research capability that will take years to overcome. These weaknesses are clearly realized and China is actively upgrading its agricultural research, education, and extension system. Resources are now being concentrated in key regional research institutes and universities, each with its own area of specialization.[39] Interaction with international research centers such as the International Rice Research Institute has grown rapidly in the last several years, and foreign training and technology are being eagerly pursued.

Pursuit of technology and training involves a number of leading agricultural producing countries at both private and governmental levels. In the case of the United States, a growing program of interaction between the U.S. Department of Agriculture and China is underway. This is taking place under the Agreement on Scientific Cooperation and Technology signed in 1979. On the U.S. side, this involves both the Department of Agriculture and the land grant colleges. The program involves the exchange of teams in various technical areas and participation by Chinese scientists in research at U.S. universities.[40]

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[37] FBIS, Oct. 16, 1980, pp. L–18 to 19.

[38] JPRS/Ag. No. 77601, Mar. 17, 1981, p. 5.

[39] These are listed in "PRC Agricultural Situation Report, 1979–80," p. 46.

[40] The USDA program is discussed more extensively in Thomas F. Kelly and Victor Muniec, "U.S.-China Scientific and Technical Exchanges Benefit Both Nations," Foreign Agriculture, July 1981, pp. 16–18.

Other programs are underway with individual universities, trade associations, and organizations such as the National Academy of Sciences. As well as assisting the Chinese, these programs are providing the United States with access to Chinese technology, an expanding body of information on Chinese agriculture, and new marketing opportunities for U.S. products.

Unless support for research is continued and strengthened, China's agriculture will face increasing difficulty in meeting the challenges it faces. Certainly over the next several years, China's past shortcomings in agricultural research will be a factor retarding agricultural growth.

GOALS FOR THE EIGHTIES

China's first response to the new pressures on agriculture was to formulate a set of very ambitious agricultural production targets for the 10-year plan (1976–85). These were developed in 1977 and 1978 with little thought to how they might be achieved. During the reassessment of economic plans and priorities in the late 1979 and early 1980, a more realistic appraisal of prospects emerged and public discussion of specific plan targets—in particular the 400 million ton grain target—was downplayed. A partial set of revised plan targets for 1985 and 1990 was given to a U.S. Department of Agriculture Economics and Statistics Delegation in October 1980 (table 5). These targets may not be final; the new five-year plan (1981–85) has not been approved and the 10-year perspective plan (1981–90) is still under discussion. But the targets do illustrate a realistic downward shift in expectations about agricultural performance.

The 1990 targets envision somewhat slower growth between 1985 and 1990 than for 1977–79 to 1985. However, in all cases the rates are above growth rates from the mid-fifties to the late seventies. At this point these targets should be taken only as general indicators and are subject to substantial future revision. Their striking feature is the continued rapid growth of meat production that is envisioned.

TABLE 6.—PLAN GOALS FOR THE EIGHTIES

[In million tons]

Items	1977–79 average	1980	1985		1990	Growth rate to 1985 [1] (percent)	Per capita production of 1985 goal (kilograms)
			Original	Current			
Grain	306.54	318.20	400.00	375.00	425.00	2.9	363.9
Cotton	2.14	2.71	3.60	3.00	3.35	4.9	2.9
Oilseed crops [2]	5.22	7.69	8.00	8.00	9.00	6.3	7.8
Meat	9.20	12.10	15.00	14.00	18.50	6.2	13.6
Aquatic products	4.56	4.50	7.00	4.80	6.00	.7	4.7

[1] Compound growth rate from 1977–79 average.

[2] Chinese definition (see table 2 footnote).

Sources: Original 1985 plan targets are from "Decisions of the CCP Central Committee on Some Problems in Accelerating Agricultural Development (Draft)." The only available version of this late 1978 draft is from a Hong Kong source and is translated in FBIS, Aug. 31, 1979, pp. L-22 to 37. The current 1985 and 1990 targets were given by Chinese officials to the USDA Agricultural Economics and Statistics Delegation in October 1980.

AGRICULTURAL PRODUCTION PROSPECTS

Meeting the 1985 targets requires growth rates from the 1977–79 base that are well above historical rates.[41] However, rapid growth of production between 1977 and 1980 puts most targets within reach. Only in the case of grains was 1980 production off the pace necessary to meet the 1985 target. These gains in production, if achieved, would permit a significant rise in per capita production of major farm products. Compared with the 1977–79 base, per capita production of grain would be up by 14 percent, cotton by 32 percent, oil bearing crops by 43 percent, and meat by 48 percent. Compared with the levels already achieved by 1980, however, the increases are much more modest: 12 percent for grain, 5 percent for cotton, 11 percent for meat, and none for oilseeds. Thus with the exception of grains and meat, only modest growth is required between now and 1985 in order to fulfill plan targets.

China should reach most of the production levels set as 1985 targets, with the major exception of grain production. Since the growth of inputs is slowing, gains in yield and production will have to come increasingly from greater efficiency. The following rough assessment of prospects for individual crops and livestock is judgmental and based on the assumption that there will be no major retreat from the new policies that have emerged in the last several years.

GRAIN

Reaching the 1985 grain production target of 375 million tons requires a rate of growth of production of 2.9 percent annually, somewhat above the historical growth rate (tables 2 and 6). Of the major crop targets, this will be the most difficult to achieve. In our judgment, the 375 million ton target represents the upper limit of possible outcomes of grain production during the next 4 years.

Rice

Production of rice is not likely to grow faster than the historical rate of 2.3 percent annually. The historical growth of rice area of roughly 0.3 percent per year (table 7) has come from increased multiple cropping and the slow northward expansion of rice cultivation. This growth is not expected to continue. In fact, between 1977 and 1979 area dropped by 5 percent, a trend that continued in 1980 and 1981, largely because of reduced multiple cropping. No significant increase in rice area appears likely during the eighties.

The historical growth rate of nearly 2 percent annually in yields has come from a combination of varietal improvement, improved irrigation and drainage, increased fertilizer use, and better management practices. Varietal improvement has been critical to this growth as the spread of semi-dwarf varieties in the sixties made possible increased responsiveness to fertilizer as well as acreage expansion. More recently, China's pioneering introduction of hybrid rice has also had a positive impact on yields.

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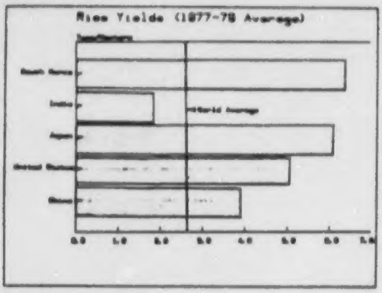
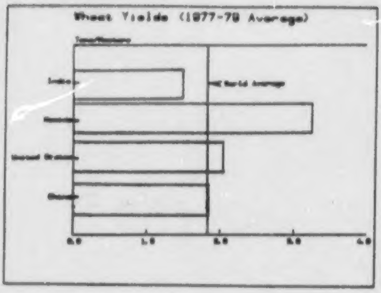
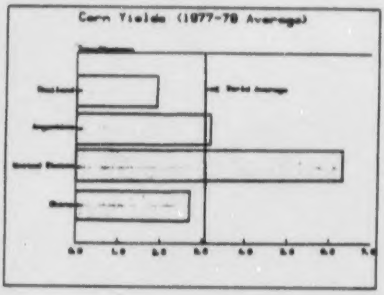
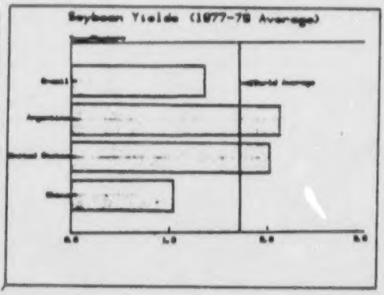
[41] The 1985 target for aquatic products is an exception to the general pattern of high growth rates. The low growth rate indicates recognition of past overexploitation of aquatic resources.









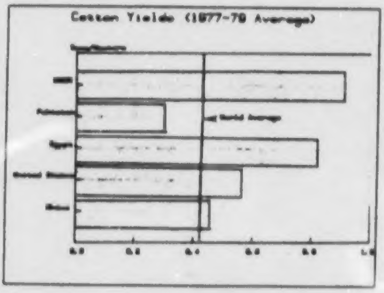


TABLE 7.—HISTORICAL GROWTH RATES FOR AREA AND YIELD[1]

[Percent per annum]

	Area	Yield
Total grain	—0.5	3.0
Wheat	.3	3.4
Rice	.4	1.9
Coarse grain	—2.0	3.5
Corn	1.1	3.2
Sorghum	—4.1	3.9
Millet	—3.8	2.8
Oilseed crop (USDA)	—1.5	1.4
Oilseed crops (PRC)[2]	— .3	.8
Soybeans	—2.4	1.2
Cottonseed	—1.0	2.6
Peanuts	—1.2	.2
Rapeseed	— .1	3.1
Cotton	—1.0	2.6

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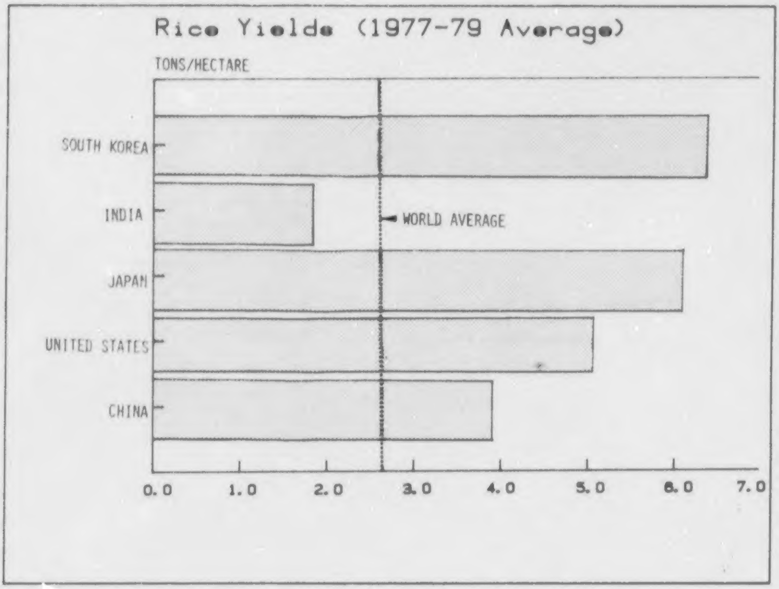
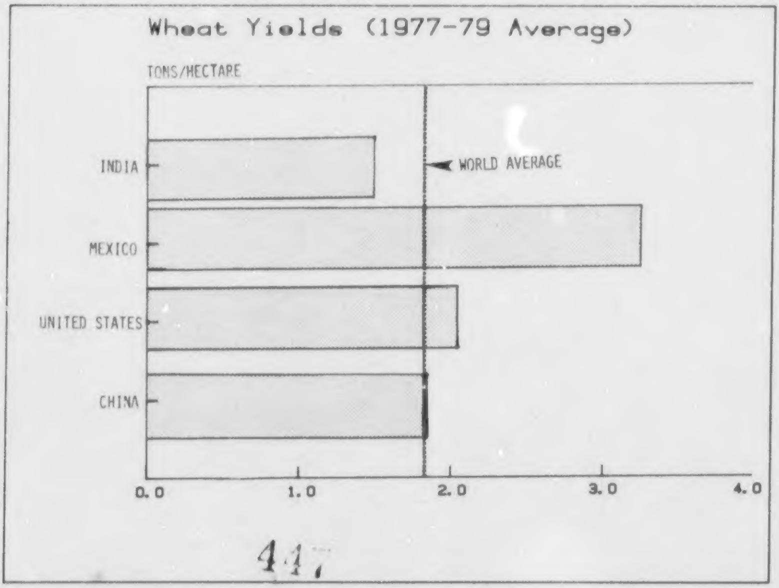
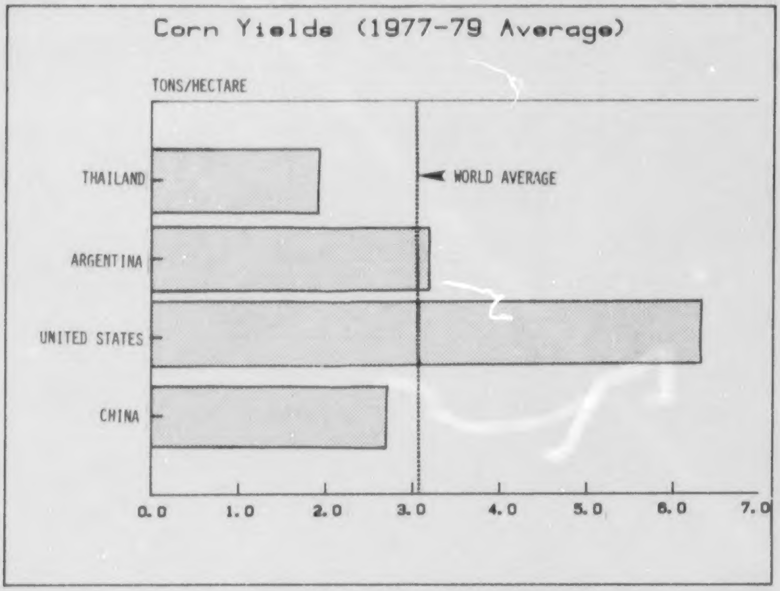
[1] Growth rates computed from 1955–57 and 1977–79 averages. Sources and definitions are identical with those in tables 2 and 3.

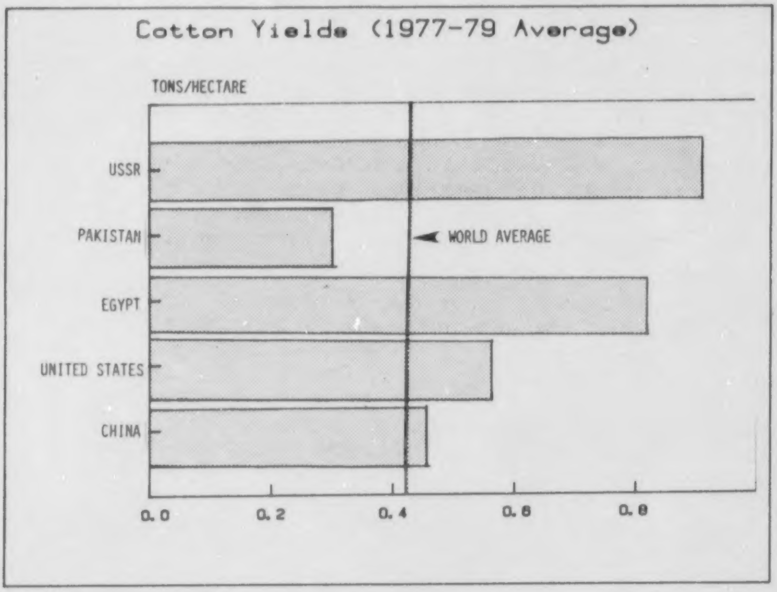
[2] Authors' estimates.

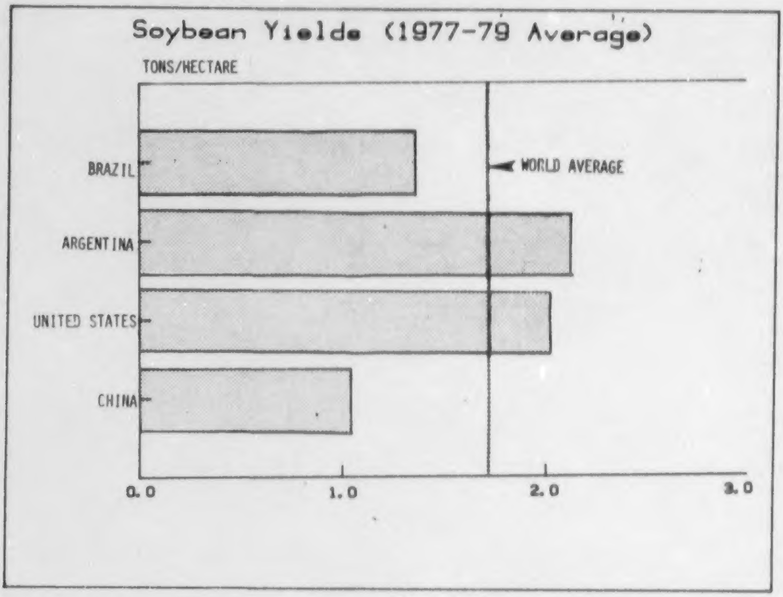
China's rice yields of 3.9 tons per hectare (1977–79 average) are already high by world standards and yields in advanced areas are extremely high (see chart). Average yields in some of the major producing provinces are already in excess of 5 tons per hectare. A considerable part of future increases in yields will have to come from backwards areas, which will be costly and may proceed slowly.






Corn Yields (1977-79 Average)


Cotton Yields (1977-79 Average)



The use of hybrid rice, which increased from 140,000 hectares in 1976 to 5.2 million hectares in 1980, played some role in the rapid expansion of yields during these years. But expansion of hybrid area has slowed and opportunities for additional use appear limited, largely due to a longer growth period and difficulties in meshing current hybrid varieties with normal cropping patterns. Lack of disease and pest resistance and high costs of production also limit hybrid rice's attractiveness and the potential for spread of current varieties.[42]

With no new varietal breakthroughs immediately in prospect and slower growth of input availabilities, growth of rice yields is not likely to substantially exceed historical rates in coming years.

Wheat

Wheat has been a rapidly growing component of Chinese grain production over the past 15 years, and the historical rate of growth of production—3.6 percent per year—is second only to corn among the major grains. Growth during the seventies was very rapid—approximately 7 percent per year. The growth of production has come from higher yields and only secondarily from expanded area (table 7). Acreage expansion has resulted from integration of new early maturing varieties into cropping patterns, making possible a winter wheat-rice-rice cropping system in central China and wheat-cotton interplanting. Central and southern China now account for nearly one-third of wheat area, although the provinces of the North China Plain still produce the majority of China's wheat.

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[42] One recent study suggests that hybrid rice production has in fact had little impact on China rice production. See Central Intelligence Agency, "Hybrid Rice Development and Seed Production in China," SW 80-10022 (Washington: May 1980). A more optimistic view of the past impact of hybrid rice which shares scepticism about its future impact is given in W. R. Coffman and S. S. Virmani, "Advances in Rice Technology in the People's Republic of China," unpublished paper, April 1981.

Higher wheat yields have resulted from a combination of improved varieties, better cultivation practices, more fertilizer, and expansion of irrigation and water control, particularly in the North China Plain. Better irrigation and water control have been crucial to the growth of production, particularly in the North.

As is the case with rice, further growth of wheat area will contribute little to production in coming years. Wheat area dropped by 5 percent between 1979 and 1981 as area shifted to other uses and area is unlikely to increase significantly during the eighties.

While Chinese yields—an average of 1.8 tons per hectare for 1977–79—are only slightly below yields of major dryland producing countries such as the United States (see chart), a major part of wheat area is irrigated. This suggests that Chinese yields are still well below potential levels and the significant continued growth can be expected. One authority has estimated that Chinese wheat yields may increase by 50 percent over the next two decades.[43] The implied rate of growth in this assessment is less than two-thirds of growth rates through the late seventies. An optimistic interpretation would put growth in coming years somewhat above the historical rate, but well below the average growth rate for the seventies.

Coarse grains

Together with wheat, coarse grains have been the most rapidly growing component of Chinese grain production. Virtually all of the increase in coarse grain production has come from rising corn output, which now accounts for about 18 percent of Chinese total grain production compared with 12 percent during the fifties. Corn area increased at a faster rate than that of any other grain crop. This area increase was largely at the expense of sharply reduced planting of sorghum, millet, and soybeans. Acreage grew at a particularly rapid pace during the seventies following the development of higher yielding hybrid varieties. Development of varieties with short growth periods that can be intercropped with wheat or planted immediately following the wheat harvest in northen China has also contributed to the increase in corn area.

Coarse grain production is likely to continue to grow rapidly during the eighties, although more balance between coarse grains is likely. The Chinese are interested in the potential of corn for food, feed, and industrial uses, particularly for sweeteners and edible oil. But they are also concerned about the cutbacks in production of sorghum and millet, important food staples in diets of poorer areas of northern China. There are also complaints about shortages of sorghum stalks for fuel and handicraft weaving as well as shortages of sorghum for feed and for use in making liquor and sweeteners.[44] Sorghum and millet are also more drought-resistant than corn and some expansion of area of these crops, largely at the expense of corn, is being urged for dryland areas. While such shifts are not likely to be large, corn area will not continue to grow at the expense of other coarse grains and soybeans and its growth will slow sharply.

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[43] Haldore Hanson, "China's Progress with Wheat and Maize," unpublished paper, April 1981.

[44] RmRb, May 21, 1981, p. 4.

Opportunities for yield improvement appear substantial, particularly for corn. Corn yields, which averaged 2.8 tons per hectare between 1977 and 1979, are still below the world average. This suggests ample room for yield growth with improvements in varieties, input supplies and management. Only about two-thirds of corn area is now planted to hybrid varieties. A small but growing share of coarse grain production will be coming from the private plots as their area grows and state controls are relaxed. To the extent that these plots are used for grain production, the major grains produced will be coarse grains. Although the effect is difficult to judge, it is likely that this shift will have a positive impact on coarse grain yields and production.

On balance, prospects appear good for continued growth of coarse grain production. A continuation of historical growth rates for coarse grains as a whole with some drop in the rate of growth of corn production appears the most likely scenario through the mid-eighties.

ECONOMIC CROPS

While China will be hard pressed to meet its 1985 grain production target, prospects are brighter for production of economic crops, at least as long as the incentive structure which has evolved in the last several years remains in place.

Cotton

Cotton production in 1985 should exceed the 3 million ton target. Although meeting this goal requires a 5 percent average annual growth rate from the 1977–79 average level of production, 1980 production increased so sharply in response to incentive changes that production for the year was only 5 percent below the 1985 target. The 20 percent increase in production for the year provides a rough measure of the impact of new policies and the 1980 production level provides a better base than the 1977–79 average for evaluating prospects for the eighties.

Cotton area in 1980 recovered some of the losses of the previous two decades, but current area is still more than 20 percent below the 1956 peak. Because of competition with other crops little further increase in cotton area is expected.

Cotton yields during coming years should grow at least as fast as the historical rate of 2.5 percent annually. A new cotton variety introduced in Shandong province during 1980 and now being extended over greater areas of the North China Plain is apparently capable of higher yields than traditional varieties. Current varieties of cotton grown in the high-yield regions of central China are U.S. strains obtained over 30 years ago. New varieties could have a positive impact on yields here as well.

The program of specialization is also improving yields. Fields previously scattered over wide areas of northern China are now being consolidated. This process is shifting cotton to better soils with good irrigation. The process also tends to improve available management and expertise for cotton cultivation. Although this may increase disease and insect vulnerability, it should on balance provide a stimulus to yield growth.

Oilseeds

Stagnant oilseed production and declining per capita supplies have been a weak link in Chinese food production. Output of traditional oilseed crops such as soybeans and peanuts rose by very little between the mid-fifties and the late seventies as area dropped and yields grew slowly (table 7). Government emphasis on grain production and unfavorable incentives were the major reasons for this. With the growth of grain yields outstripping those of most oilseeds by a substantial margin, and since there was very little increase in the price of oilseeds relative to grain, the profitability of oilseed crops compared to grain dropped. When possible, producers reduced oilseed area or, where confronted with state-set oilseed acreage targets, neglected their crops once they were planted.[45] Cutbacks were greatest for soybeans, peanuts, and cottonseed, which compete directly with grain, particularly coarse grains, for area.

The growth in oilseed production that did occur was due to rising production of rapeseed and, more recently, sunflowerseed. Rapeseed is grown mainly in eastern, central, and southwestern China, primarily as an overwintering crop. Acreage has expanded rapidly during the seventies as the crop was introduced into fields that were previously left fallow or planted with green manure crops during the winter. More recently area has expanded at the expense of wheat and double cropped rice. Sunflowerseed area expanded in the late seventies with the introduction of high oil content varieties into Northeastern China and Nei Monggol. Between 1977 and 1980 area of sunflowerseed increased nearly 200 percent and production rose to 900,000 tons, 3.6 times the 1977 level. In addition to its high oil content, sunflowerseed can be grown on poor soils, is drought resistant, and has a short growing season. This makes it an attractive crop in marginal areas of northern China.

Higher oilseed prices and new policies contributed to a marked rise in production of peanuts in the late seventies and, in 1980, of cottonseed. Because of these increases and rising sunflower and rapeseed production, oilseed production rose by a total of 38 percent between 1977 and 1980.[46] China has thus far had little success in stimulating a recovery of soybean production, however. Production of soybeans in 1980 was still 31 percent below the peak year of 1959.

Oilseed production will rise in the eighties, but at more modest rates than those of the late seventies. Area will grow more slowly. How much further rapeseed area can expand is uncertain. Further growth of sunflowerseed area is likely, but continued rapid expansion will encounter increasing conflict with grain acreage. Similar problems face expansion of peanut and soybean area. The recent growth of yields may also slow; policy changes have already had a significant impact on yields of most oilseeds and further growth will be more difficult.

Soybeans are the major question mark. The government has attempted to encourage production but efforts have so far been largely unsuccessful. These efforts are continuing. Soybean procurement quotas are being lowered, making more of the crop eligible for the higher above-quota price.[47] In areas where soybeans and grain are lumped together for procurement purposes, the ratios used in computing the grain equivalence of soybeans may be raised and part of the bean cake returned to the production teams after pressing.[48] If the proper mix of incentives is found, there could be a sizable production response in a short period of time.

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[45] JPRS/Ag. No. 77101, Jan. 5. 1981, pp. 5–11.

[46] This refers to the USDA definition of oilseed. See table 2 for the difference between this total and that reported by the Chinese.

MEAT

Growth of income will generate increasing demand for meat in the eighties, a fact clearly recognized in both the 1985 and 1990 plan targets for meat production (table 6). China's meat production is predominantly pork. However, in the last several years livestock policy has shifted in the direction of diversification, increasing the role of sheep, goats, and cattle in expanding the livestock sector and meat and livestock product production. This shift is a clear indication of concern over the grain and feed requirements of a livestock program which relies heavily on extensive feeding of livestock. More effective utilization of China's large grassland resources will reduce some of the pressure on grain supplies.

Grassland development will be a slow process and, while beef and mutton production may grow more rapidly than in the past, the bulk of increased meat production over the next several years will be pork. Pork production rose rapidly in the late seventies in response to reduced control over household sideline activities and higher state procurement prices for hogs. Meat production increased by 55 percent between 1977 and 1980; probably over 90 percent of the gain was pork.

Between 1980 and 1985 meat production should rise by enough to meet the 1985 target of 14 million tons of meat. The target can be met with only a 3 percent annual growth in meat production over the next five years. The rapid increase in meat production of the past few years is not likely to be repeated, however. Gains in efficiency in hog raising and a substantial rise in use of grains and oil meal for feed permitted both rising pork production and growing hog inventory numbers through 1979. In 1980, however, the gain in pork production was in part due to slaughtering at a rate above the replacement level. Inventories of hogs at the end of 1980 were down to 305 million, a 4.5 percent drop from the 1979 number. Future growth of meat production will more closely follow the growth of grain and protein feed availability. Gains in meat production will have to come from a combination of higher weight at slaughter, more rapid weight gain, and a higher slaughter rate. No significant increase in inventory numbers is planned.

Looking at pork production over the next 5 years, a rough estimate indicates that about 12 million additional tons of feed grain will be required over and above current feed requirements to meet the 1985 target.[49] This is perhaps 25 percent of the likely increment in grain production during the period. Anticipated growth of oilseed production should also provide the needed protein supplements. Growth of feed use of grains of approximately this order of magnitude would leave an adequate allowance for greater food use, industrial use, and additions to stocks. Attempting to push much beyond the target, however, could lead to problems of inadequate feed supplies.

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[47] RmRb, Apr. 15, 1980, p. 1.
[48] JPRS/Ag. No. 77101, Jan. 5, 1981, pp. 5–11.
[49] This assumes a 4 to 1 grain-liveweight conversion rate for hogs.

CONCLUSIONS

The outlook for agricultural production between now and 1985 is cautiously optimistic. In order to meet 1985 plan targets, production of most major items must grow by only slightly more than historical rates. For some items, e.g. oilseed, cotton, and meat, plan targets may well be exceeded. Grain production, however, may fall short of plan goals. Even so, the shortfall should not be great enough to prevent achieving the meat production target.

Several issues loom as important problems for the eighties. The probable increases in per capita production are modest and growth will be much slower than in the late seventies. The increases that seem feasible may prove inadequate to meet the new demands now being placed on agriculture. Such a shortfall could generate pressure for further changes in agricultural policy.

A second problem is the potential for conflict between new policies and values of China's leadership. The side effects of new policies may prove more severe than the leadership anticipates or is willing to accept. Inequality in rural income distribution may well increase. New production responsibility systems and the growing use of production contracts with households and small work groups are a potential threat to the collective ownership system. They may also prove to be very difficult to administer and control. Finally, the expansion of private plots and household sideline activity is also a threat to the strength of the collective system. Rising income from private activity and diversion of labor and other inputs away from the collective sector may seriously hamper the growth of collective production.

The growing role of indirect planning and greater local autonomy makes it difficult for China's planners to project and anticipate production and the response to new policies. This has already occurred with the decline in grain area over the last several years. The extent of the decline was apparently unanticipated. A similar situation arose with increases in purchase prices. In the case of hogs, for example, the supply response to higher procurement prices was greater than expected, leaving some areas unable to purchase all the hogs offered for sale and forced to cut retail prices temporarily to dispose of large quantities of meat. This type of situation is a source of frustration to officials accustomed to direct planning and a command economy.

Related to uncertainty and the loss of direct central government control is the growing interdependency between producers and suppliers of inputs, farm units, and end users which is involved in the process of modernization and commercialization of agriculture. Linkages become much more extensive and complex and require development of a complicated infrastructure which includes, for example, information systems, machinery repair, transportation, storage, and processing. The existing infrastructure is rudimentary and there is no adequate mechanism to ensure its development. Progress is likely to occur through a series of after-the-fact reactions to crises and bottlenecks. Modern management skills and knowledge of the characteristics of a modern farming system are lacking and there is no comprehensive integrated plan or approach which deals with the totality of agricultural modernization. China's agricultural modernization will proceed haltingly with many missteps.

These problems and conflicts, together with the possibility that agricultural production, particularly of grains, will not grow rapidly enough to keep pace with the growth of demand, suggest that there may be a good deal of ongoing tinkering with the agricultural system in coming years. Agricultural policy may well vacillate, responding first to one problem and then to another. It is possible that return to more direct central control will be seen as the way to deal most effectively with problems as they arise. Should this occur, however, China may lose what is being counted on to provide much of the growth in agricultural production—gains in efficiency stemming from decentralization.

Finally, there is a strong strand of continuity between current agricultural policy and past approaches to agriculture. Organizational and structural changes are being relied on to stimulate lagging production. While rhetoric stresses the importance of agriculture, central government budgetary support for agriculture and agriculture-related industry remains limited. This may be temporarily successful, but greater diversion of resources from other sectors of the economy to agriculture is likely to be a necessary long-term cost of a successful agricultural development program.

CHINA: THE DRIVE FOR DIETARY IMPROVEMENT

By James A. Kilpatrick*

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APPENDIX

Derivation of Production Based Estimates 461

I. INTRODUCTION

Chinese grain production can now be maintained at a level that supports an adequate basic diet. The problem the Chinese face now that they can feed themselves is improvement in the quality of the diet. China's present government gives high priority to raising personal incomes and living standards. Quality foods, especially meat, will be viewed by the Chinese as an important aspect of raising living standards. If per capita incomes rise, as they will if the Chinese are successful, increases in consumer demand for non-grain food products will press China's agricultural production capabilities for the rest of this century. Recent increases in meat, oil and sugar supplies have begun to partially meet this demand but population growth and technical and resource limitations will make continued increases in per-capita supplies difficult.

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Increases in demand for non-grain food products probably will be about proportional to rising per capita income. Because of the low level of per-capita incomes, food accounts for about two-thirds of consumer expenditures (67.7 percent in 1978 and 63.9 percent in 1979 among rural consumers, and 60.6 percent of urban consumers' total expenditures in 1980, according to surveys).[1] Low per-capita incomes and low expenditures in the better off urban areas on many types of foodstuffs imply that the income elasticity of demand for food is relatively high, so that if consumers' incomes rise (including both rural and urban consumers), the effective demand for agricultural products will rise proportionately. The long stagnation of food consumption levels also suggests that demand could increase even more rapidly because of the need to "catch up" on previously missed consumption.

Recent production and import statistics reflect some of the changes already taking place in consumption. Production of meat and oilseeds has risen sharply. Total oilseed production rose from 4.015 million tons in 1977 to 7.691 million tons in 1980, and meat production from 7.8 million tons in 1977 to 12.055 million tons in 1980. Imports have supplemented consumption, with soybean oil, grain, and sugar all being imported in significant amounts.

This paper examines whether planners can meet future levels of demand for food without severe strain on agricultural resources and technology. Current consumption levels of and prospective changes in demand for non-grain foods are estimated, and then compared with the prospects for increases in non-grain food supplies. Consumption is estimated using both survey results and production and trade data. Future demand levels are projected based on population growth rates and increases in demand prompted by higher incomes. Finally the prospects for meat production are evaluated, and production possibilities compared to projected demand levels. Information on food consumption is still scarce and many of the judgments in this paper must therefore remain tentative.

II. CURRENT STATUS IN FOOD CONSUMPTION

A. ESTIMATED AVERAGE CONSUMPTION

Information from several sources on consumption levels of various products at different times is summarized in Table I. The sources agree that current levels of consumption of most food products are still relatively low. The Chinese and U.S. estimates of food consumption are based on surveys. Production based estimates were derived from production and import data for 1977 and 1979. Domestic consumption of any commodity is assumed to be equal to domestic production less the sum of net exports (or plus net imports) and net inventory accumulation. Since we know domestic output and trade for most products, we can estimate per-capita consumption (assuming negligible inventory change) independently of the survey estimates discussed above. (See Appendix)

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[1] JPRS 77200 p. 1, and FBIS Apr. 24, 1981, p. K13.

TABLE 1.—CHINA: ESTIMATED FOOD CONSUMPTION 1955, 1977, AND 1979

[In kilograms per capita]

	1955 [1]				1977 [3]				1979 [3]			
		Survey estimates				Survey estimates				Survey estimates		
	Production based estimate [2]	Rural	Urban	Shanghai	Production based estimate	Chinese	United States [4] (A)	United States [4] (B)	Production based estimate	Rural	Urban	Tota
Grain		188.8	158.45	135.37		196.5(B)	180.0	177.0		322.5(C)		
Sugar	1.32	.4	1.30	2.08	3.61	2.8(B)	3.0	1.8	3.70			
Oils	1.92	1.2	4.55	5.10	1.98	1.6(B)	3.0	3.0	2.85			
Vegetables		88.6	81.25	96.75			90.0	43.8				
Fruit	4.19						12.6	6.0	7.20			
Eggs						2.2(B&D)	3.6	1.2				
Meat	6.55	3.3	5.90	8.10	8.25	8.4(B) or 7.5(D)	9.6	4.2	10.94	7.5(E)	19(A)	11.0(D) or 9.5(E)
Poultry				1.35			3.0	1.2				
Fish	4.14			13.70	4.97		6.0	6.0	4.43			
Milk						1.1(D)			1.10			

Sources:

[1] 1955 estimates: Chen, Nai-Ruenn, "Chinese Economic Statistics," pp. 438 and 440. Chicago: Aldine, 1970.

[2] Production based estimates: Appendix table A–1.

[3] 1977 and 1979 Chinese survey estimates: (A) FBIS, 28 July 1980, L15, pork only. (B) "Jingji Kexue," No. 1, Feb. 20, 1980, pp. 14–20; meat and oil 1978; others 1976–77. (C) FBIS, June 16, 1980, p. L15. (D) "Guangming Ribao," June 7, 1980, p. 4. (E) FBIS, July 2, 1980, p. L12, pork only.

[4] U.S. estimates: (A) Henry J. Groen and James A. Kilpatrick, "China's Agricultural Production;" table 4, p. 645, in Joint Economic Committee of the U.S. Congress, "Chinese Economy Post-Mao." Washington: U.S. Government Printing Office, 1978. (B) National Foreign Assessment Center, "China: Demand for Foreign Grain," table 3, p. 2. Washington: CIA ER 79–10073, January 1979.

Compared to average levels in other East Asian countries, Chinese consumption of meat, fish, dairy products and oils is considerably lower (see Table 2). For purposes of comparison, data on Japan and Taiwan from the 1950s and 1960s are used. This was a period when both countries were in transition to higher consumption of quality foods, a process the Chinese are just beginning. The average consumption of calories and of protein in the Chinese diet has been adequate, but consumption of fats and oils and of meat is relatively low. Before the large increases of the past two years, average consumption levels differed little from historical levels. For example consumption of meat had increased since the 1960s, but edible oil consumption had declined.

TABLE 2.—ESTIMATED FOOD CONSUMPTION AND INCOMES IN CHINA AND OTHER COUNTRIES

[Kilograms per capita]

	Japan			Taiwan			Hong Kong	Singapore	China
	1955-56	1960-62	1969	1951-53	1960-62	1969	1964-66	1964-66	1977
Grain	187.4	183.3	165.2	169.7	186.8	190.7	131.1	142.0	196.5
Sugar	12.4	16.1	24.1	9.5	9.5	12.8	21.9	38.0	2.8
Oils	2.9	4.7	9.9	3.7	4.7	6.9	11.7	7.3	1.6
Vegetables	93.4	113.2	137.6	61.7	58.0	74.5	63.9	49.6	43.8
Fruit	19.3	30.3	49.6	17.9	21.2	35.8	46.4	56.6	6.0
Eggs	3.7	6.9	14.2	1.5	1.5	4.0	9.9	4.4	2.2
Meat	4.0	7.7	15.0	16.8	16.1	27.4	40.5	27.4	8.4
Fish	25.2	29.2	30.7	8.4	12.0	15.0	21.2	20.4	5.0
Milk	13.1	25.2	47.5	1.5	4.7	6.9	19.0	58.4	1.1
Protein	23.7	25.8	27.4	18.2	21.4	24.9	23.7	22.9	16.5
Calories (per day)	2,210	2,330	2,450	2,140	2,350	2,620	2,370	2,430	1,936
Per capita GNP (1977 U.S. dollars)	821	1,169	2,738	219	321	545	490	419	180

Sources: Other countries, Food and Agriculture Organization of the United Nations, "1970 Production Yearbook," table 135 Rome: FAO, 1971. China, table 1. Vegetables, protein, calories, and fruit from United States B; fish from production based estimate; other from Chinese surveys. Per capita GNP estimates for China from SSB data; others from International Bank for Reconstruction and Development, "World Tables," 2d edition, 1980, pp. 100, 174, 109, 250, 268–269 Constant-price GNP was divided by midyear population, and converted to U.S. dollars for the base year at the base year exchange rate. The U.S. dollars for the base year were converted to 1977 dollars using the U.S. GDP deflator.

B. VARIATIONS IN CONSUMPTION

The estimates presented here are for average consumption across the entire population. There is considerable variation in the level of consumption of food and of individual food products depending on whether consumers are rural or urban, what their income levels are, and the geographical peculiarities of the regions in which they live. Available data do not permit accurate estimates of this variation in consumption of food items. Nevertheless, by using average levels we can make comparisons with past Chinese levels, and provide a benchmark for evaluating Chinese progress up to now and in the future.

Urban consumers, with higher average incomes, tend to consume more meat and less grain than their rural counterparts. Higher-income consumers generally tend to consume more meat. And areas that are chronically in deficit in food production and have to depend on state subsidies, or that have been struck by natural disasters, also have less to consume. Some recent Chinese press reports have included estimates that 100 to 200 million rural consumers have inadequate diets. Rural incomes, which are on average less than urban incomes, are also unequally distributed. A 1979 survey showed that the proportion of basic production units (mostly production teams) with average per capita collective incomes less than 40 yuan was 8.2 percent; only 7.6 percent had incomes greater than 150 yuan.[2] The average collective income that year was 83.4 yuan. Household income is even more unequally distributed.

III. ESTIMATING PROSPECTIVE DIET CHANGES

A. THE FOOD CONSUMPTION PROBLEM

Because of the current low levels of consumption of many food products, it is now Chinese policy to supply consumers with more quality food. Meat products have become more plentiful, for example, and are no longer rationed. Nevertheless, current meat consumption levels are low relative to other countries, and any increases in real incomes in China are likely to induce increased demand for meat. Mainly because of distribution problems consumers in urban areas have had the most difficulty in translating their higher money incomes into desired purchases of food (in the past this has been reflected in rationing and shortages). The most significant potential change in Chinese diets in the next five to ten years would be an increase in the consumption of pork, poultry and eggs.

Production of more vegetables, fruit, soybeans and other non-grain crops is mainly a matter of changes in planting patterns and does not require large additional investment. The Chinese have in fact begun to shift some acreage from grain to other crops. Given the constraints of available land in China and the fact that newly reclaimed cropland each year usually only balances that taken out of production for construction and other uses, this means that the amount of cropland available to the Chinese to plant grain, either for food or feed, is not likely to expand in the foreseeable future.

B. POPULATION AND INCOME FACTORS

1. Population

Demand for food products depends mainly on total population, real income, and the income elasticity of demand for food. China's population has increased at an average annual rate of about 2 percent since the 1950s. The government is now committed to reducing the rate, and in the last few years has made some claims of initial success. The reported rate of increase has dropped to 1.2 percent. Since the extent of future success in population growth control is unknown, two alternative assumptions are made here—the first of a lower growth rate of 1.2 percent, and the other of a growth rate of two percent. Given China's reported yearend population of 982.55 million, the projected populations are:

CHINA: PROJECTED POPULATION

[In millions at yearend]

	1980	1985	1990
Growth rate:			
1.2 percent	982.55	1,042.93	1,107.03
2 percent	982.55	1,084.81	1,218.99

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[2] Collective income accounts for about two-thirds of total rural income. It includes income in kind as well as cash income from sales of collectively produced products and work in collective industrial enterprises.

2. Income Elasticity of Demand

The extent to which increases in income will result in higher consumption levels of food products depends on the income elasticity of demand for food. At low income levels, such as those prevailing in China, the income elasticity of demand for food is usually relatively high. Direct evidence on Chinese demand is scarce, but it is likely that the elasticity of demand for certain non-grain products is high, probably close to unity in many cases. For example, a Chinese study of workers and employees in 1956 found that those with annual per capita incomes above 300 yuan consumed 26.95 kilograms of meat, poultry, and aquatic products per person, while those with incomes below 80 yuan consumed 5.80 kilograms, or less than one-fifth as much. In intermediate income groups the amount of these products consumed rose uniformly at each higher income level; the ratios of the percentage increase in meat consumption to the percentage increase in income (from midpoint to midpoint by group) were over 0.5. A 1955 survey of peasants found similar results. In rich peasant households meat consumption averaged 5.7 kilograms per person, and edible oil consumption averaged 1.5 kilograms, compared to 3.7 and 1.15 kilograms respectively for poor peasants; consumption by middle peasants fell in between. For grain the difference between poor and rich was less marked: 176.5 kilograms as opposed to 206.5.[3] In both the 1950s and the 1970s urban consumers, who have higher incomes, consumed more meat than rural consumers. Although there is little data on consumption in the late 1970s, it appears that since the 1950s per capita meat consumption has risen about as rapidly as incomes, if not more rapidly. This suggests that income elasticity of demand for meat is probably one or more.

Data from other Asian countries also shed light on the pattern of increases in demand for food products one can expect in China. Some income elasticities of demand for various food products have been estimated for countries outside of China. A number of these are shown in Table 3. The elasticity of demand for meat, milk and fish tends to be near one, or even higher in some cases. That for grain is closer to zero or negative. The elasticities for non-grain foods in countries at lower income levels tend to be higher than those in countries with higher income levels.

C. ESTIMATING FUTURE DEMAND

The combination of increased income and relatively high income elasticity of demand will together cause per capita consumption to increase. Combining the requirements of a larger population and demand generated by increased income, one can project future levels of demand. The result will necessarily be a range, since one cannot know in advance what the population growth rate will be or what the rate of increase in incomes will be, and the exact income elasticity of demand is also unknown.

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[3] These survey data are summarized in Chen, Nai-Ruenn, "Chinese Economic Statistics," tables for chapter 8, on pp. 428–440, Chicago: Aldine, 1967.

TABLE 3.—ESTIMATED INCOME ELASTICITY OF DEMAND FOR FOOD PRODUCTS[1]

	Meat	Pork	Poultry	Fish	Whole milk	Vegetable oils	Sugar	Cereals	Vegetables	Fruit
Taiwan	0.86	0.20	1.00	0.91	1.60	0.90	0.94	0.32	0.30	0.76
Hong Kong	.55	.50	.80	.50	.80	.30	.80	.23	.80	.86
Singapore	.79	.70	.90	.40	.70	.70	.20	.14	.80	.82
Korea	1.16	1.20	1.50	1.10	1.60	1.50	1.20	.28	.40	.90
India	1.17	.80	1.50	1.50	.80	1.00	1.03	.25	.70	.80
Japan	.79	.90	.90	.30	.50	.40	.39	−.07	.60	.57

[1] Income elasticity of demand for a product is the ratio of the percentage change in demand for the product to the percentage change in income.

Source: FAO, "Agricultural Commodity Projections, 1970–1980," appendix tables B. Rome: 1971. See also OECD, "Agricultural Projections for 1975 and 1985," pp. 76–77. Paris: 1968.

Per capita production of meat (total production divided by year-end population) increased from 6.16 kilograms in 1957 to 8.25 kilograms in 1977, an average annual increase of 1.47 percent. Per capita production further increased in 1980 to 12.27 kilograms, for an average annual rate of growth since 1957 of 3.04 percent. The small increase in meat consumption between 1957 and 1977 occurred while per capita incomes were stagnant. Since the 1957–77 rate of growth was apparently only barely satisfactory to the Chinese, 2 percent per year is used here as the lower limit of probable income-induced increases in demand (see Table 4 which also shows the results of a 4 percent rate of growth).

Rates of growth at the lower end of this scale might not be satisfactory for either consumers or planners. An average growth rate of 2 percent in per capita meat production would probably not match prospective increases in the quantity demanded by consumers, and would lead to the re-imposition of rationing and/or higher prices. Rates of growth at the highest end of the scale, on the other hand, might be technologically unattainable.

1980 is used in Table 4 as the base year for estimating future demand for meat. Meat production and per-capita consumption in 1980 both were relatively high by Chinese standards. Output had increased by half over the level of 1977–78, and rationing was unnecessary in most places.

TABLE 4.—PROJECTED MEAT DEMAND: TOTAL AND PER CAPITA

[Units: Million tons (total) and kilograms (per capita)]

	1985		1990	
	Total	Per capita	Total	Per capita
Income-induced growth rate of demand:				
Population growth rate: 1.2 percent:				
2 percent	14.12	13.54	16.56	14.96
4 percent	15.57	14.93	20.10	18.16
Population growth rate: 2 percent:				
2 percent	14.69		18.24	
4 percent	16.20		22.14	

Note: The total in 1980 was 12,055: per capita was 12.27. Per capita figures are the same for either population growth rate.

IV. PRODUCTION REQUIREMENTS AND POSSIBILITIES

A. MEAT PRODUCTION

Future increments to meat production will require inputs of grain. The marginal cost in terms of grain of previous levels of meat production in China was probably very low, near zero, because little grain was fed. Non-grain sources of feed (including garbage, vegetable residues and water plants) have become nearly fully utilized, however, so that future increases in meat production will depend more on the use of grain for feed. Feeding more grain means that more meat can be produced from the same stock of animals. For example, there were large increases in pork production in 1979 and 1980 even though there were not large increases in the number of hogs in the herd; hogs were brought to slaughter more quickly, and slaughter weights increased somewhat. This was presumably facilitated by the greater availability of grain in the countryside beyond that needed for direct human consumption.

1. Production potential

Table 5 illustrates the constraints on China's ability to produce meat based on domestic grain resources. All but the most optimistic assumptions about population growth, the rise in per capita demand for meat, and the rate of growth of grain production yield the conclusion that China's need for imported grain will increase over this decade. Even by the middle of the decade the increase in requirements could be substantial.

TABLE 5.—GRAIN BALANCES

[In millions of tons]

	1978–79 average	At 2 percent growth rate for grain		At 3 percent growth rate for grain	
		1985	1990	1985	1990
Total grain output	318.43	351.34	387.91	368.90	427.66
Net grain output	222.90	245.94	271.54	258.23	299.36
Demand for food grain	231.48	250.30–260.35	265.69–292.56	250.30–260.35	265.69–292.56
Demand for feed grain		20.98–33.46	35.62–69.10	20.98–33.46	35.62–69.10
	–8.58	–25.34 to –47.87	–29.77 to –90.12	–13.05 to –33.58	–1.95 to –62.30

Note: Net grain output refers to total output less seed and other losses, including waste and transport losses. The conversion rate used here is 70 percent. Demand for foodgrain is based on population growth rates of 1.2 and 2 percent and per capita consumption of 240 kg. Demand for feed is based on meat demand from table 4, less 1979 meat output (10,724,000 tons), times the assumed conversion rate of 6. This gives the increase in feed levels over 1979 requirements 1978 and 1979 grain imports were 9,437,000 and 10,855,000 tons.

Grain import requirements are estimated here on the basis of the difference between projected production and demand for grain for food and feed. Per capita direct grain consumption of 240 kilograms is assumed with population growth rates of 1.2 and 2.0 percent. Feed requirements are estimated on the basis of demand for meat (see Table 4) and a feed: meat conversion ratio of six to one for increments to meat production over the 1979 level.

a. The Grain: Meat Conversion Ratio.—Conversion ratios from grain to meat range up to ten or more for unimproved breeds of large animals in processes using little capital and backward technology. U.S. hogs require 3.25 pounds of air-dry concentrate feed to produce one pound of meat. These are breeds receiving well-balanced rations, possibly with supplements of vitamins and minerals and growth stimulants, and adequate veterinary services. For U.S. cattle the ratio is over twice as high. OECD used a ratio of 6:1 for pork for projections for those countries, although ratios found in practice went as high as 12:1 (in Japan). The average ratio for poultry in the OECD study was 5.4 to one. A Chinese source used a ratio of 4:1 for pork and 2:1 for chicken as a rough guide, and an American authority reporting on China after his visit used 5:1 as an overall rule of thumb.[4]

China's undeveloped infrastructure and technical capabilities make it unlikely that the PRC will achieve the highest efficiency soon. Over a period of time, with investment in such needs as production facilities, improved breeds, and training of personnel, they should be able to improve productivity at the margin, so that the opportunity cost of further increases in production could decline. In these projections it is assumed that over the next decade the conversion ratio will average 6:1. To project feed requirements in Table 5, 1979 meat output (10.624 million tons) was subtracted from the projected future meat outputs. The difference represents meat to be produced by grain conversion and allows an estimate of additional feed requirements.

b. Grain Requirements for Food.—In projecting requirements it is assumed that grain consumption for food will be 240 kilograms per capita per year, and that unhusked grain is converted for consumption at a 70 percent rate. The average per capita grain consumption in China 1979 was 240 kilograms, compared to 214 kilograms in 1976. It is assumed that direct grain consumption will now level off, since it has reached a high level compared both to other countries and to historical Chinese levels. The slow increases in per capita meat consumption projected here might cause direct grain consumption to decline slightly, but that could be offset by an increase in the use of grain for industrial and other purposes and finer milling.

The milled grain conversion rate depends on milling efficiency, the varying proportion of waste and loss in other processes and transport, the proportion used in the current and following year, net exports and imports, and the proportions used for seed and for industrial and other purposes. Using a rate of 70 percent, consumption of 240 kilograms of grain per year implies a per capita requirement of 342.86 kilograms of unhusked grain per year.

2. The use of imports

Direct imports of meat would not be able to meet projected demand levels because foreign exchange costs and investment requirements would be prohibitive. For example, one million tons of pork represents only 8 percent of China's 1980 meat consumption, but constitutes almost all the pork available on world markets. At a price of U.S. $2.50 per kilo, such a purchase would exceed the costs of China's total current grain imports. Even if the meat were available in these quantities and affordable, refrigerated storage and transportation facilities would have to be expanded massively to bring it to consumers.

This means that feed grain will have to be imported to support domestic livestock production. The amounts involved are very large, since at present levels of feeding efficiency even doubling Chinese grain imports would provide only about a 2 million ton increase in total meat output. Assuming the Chinese are successful in raising personal income, and that they have moderate success in controlling population growth and increasing domestic grain production, the requirement for imported grain for food and feed is likely to surpass 25 million tons by the middle of the decade and to continue to increase thereafter, perhaps even more rapidly.

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[4] See Cullison, Arthur E., "Feeds and Feeding" (2nd ed.), p. 373, Reston, Va.: Reston Publishing Co., 1979; Organization for Economic Cooperation and Development, "Agricultural Projections for 1975 and 1985," pp. 113–120 and Tables 1 and 2, Paris: OECD, 1968; Fang Yuan, "Wo Guo Nong ye Xiandaihuade Jiben Rewn Ying Shi Tigo Danweimian Zhichanliano" ("Increase of Unit Yield should be the Basic Task of China's Agricultural Modernization), in Jingji Yanjiu No. 3, 1980, pp. 3–9 (see p. 8), and Hoefer, Jacob A., "A Look to the Future: China's Animal Industry," in Animal Agriculture in China, pp. 161–165, Washington: National Academy Press, 1980.

3. Production requirements

The key variables that will determine how well the Chinese in fact satisfy demand from domestic sources and thus limit imports are the rate of growth of population, the efficiency of their feeding program, and the results of their grain production program. Population growth plans now call for a growth rate of one percent to the year 2000. Prospects for increased meat production are reduced with higher population growth rates, simply because further increments to the already large population compete with livestock for the available grain. The rate of growth of population since the 1950s has been about 2 percent. Recent emphasis on birth control, including economic and other incentives and penalties, has paid off in reported birth rates near one percent for the last few years. Growth rates are lower in cities, which may be helpful to the Chinese in that it may ease the problem of food transportation and storage in supplying cities. However, there is considerable doubt whether lower rates can be sustained over very long period.

Future increases in meat production will depend primarily on the availability of grain for feed and on the efficiency of use of feed. The opportunity cost of additional meat consumption will therefore be measured in potential direct grain consumption foregone or in the resources needed to produce more grain. The limits to expansion of meat production with traditional scavenging and waste feeding have already been reached, and future expansion will require feed and fodder. The feed program, in other words, will be supported by a reduction in potential food grain consumption, or an increase in resources other than land used to produce grain.

The amount of land available to be used to produce grain will not increase—i.e. land will not be taken away from the production of cotton, vegetables, sugar or other crops to plant grain. The Chinese have not increased their cultivated acreage since the 1950s, and they are not likely to do so in the foreseeable future. Additional land is either unsuitable for cultivation or remote, and much existing farm land is being converted to non-agricultural uses. And land previously used for grain under government acreage quotas is now being allocated to other crops.

Grain production growth will therefore depend mainly on raising yields per unit of land. As in the past, most increases in Chinese unit yields will have to come from greater use of fertilizer and irrigation, and from the use of improved seed varieties. The use of improved seeds is already widespread in the more advanced and productive agricultural areas of China. Chemical fertilizer production and use has increased relatively rapidly, with 1980 application reaching an average 127.8 kilograms of nutrients per hectare. In more advanced areas application levels are considerably higher. Future plans for production and use are not yet clear, but requirements will be huge. For an increase in grain production of just under 10 million tons of grain per year, for example (representing an annual rate of growth of 2½ to 3 percent), the amount of fertilizer nutrients needed will increase by about one million tons per year. This would mean a total requirement in 1990 of 22 million tons of nutrients, and application of just over 200 kilograms per hectare from chemical sources. Actual requirements could well be larger if the response to fertilizer begins to decline at higher levels of application. Water conservancy can be improved mainly by increasing efficiency through investment in sprinkler and other irrigation equipment. This may still be a source of output increases, but most areas that are not now served by irrigation facilities probably will not be because of inadequate water resources. In addition to the difficulty of producing sufficient feed grain for on-farm meat production, procurement of grain from the countryside to use for feed by specialized meat-producing farms may also become a problem.

The third requirement for increased meat supply is the need for investment in the livestock industry—in facilities for production, processing, storage and transport of meat, in training the necessary personnel, and in breed improvement. Even in 1979–80, when meat production and sales increased rapidly the Chinese found their processing and storage facilities overwhelmed. They have begun the necessary investments, but future requirements will be much larger. Furthermore, if higher production is to be attained at all (not to mention if it is to be efficient) the whole nature of the livestock industry will have to change. The levels of demand we have projected cannot be met by reliance mainly on traditional small-scale household-based production. The industry must be generally modernized if it is to expand.

4. *Technical requirements*

a. Cold storage.—Construction of much more cold storage is necessary to accommodate higher production and greater commercialization of animal husbandry. Construction has begun to increase, with 100,000 tons of storage added in 1979 (more than any year since the 1950s) and 189,000 tons in 1980, bringing the total to 1.31 million tons.[5] When prodution and sales of meat increased rapidly in 1979–80, lack of storage in some areas forced commercial departments to reduce prices or refuse purchases.[6]

b. Breeding and feed efficiency.—Improved animal breeds will be needed to achieve more efficient use of feed. For example, there is now a large variety of hog breeds—perhaps 200 or more—and great variation in potential efficiency.[7] The Chinese at present are only at an early stage in obtaining more efficient breeds, and many decisions remain to be made concerning goals and the commitment of resources. Some imports of foreign breeds have been used in this work, but much of it is now carried out locally, with little central direction.

The Chinese are rapidly expanding compound feed production. 1980 output was over one million tons, compared to 1979 output of 390,000 tons. Of 98 factories which produced a total of around 980,000 tons of compound feeds in 1980, 41 were built before 1979, 57 in 1980; an additional 125 factories are now being built.[8]

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[5] Xinhua, Feb. 4, 1980, p. 5 and Apr. 3, 1981, p. 21.

[6] See e.g., FBIS, Jan. 29, 1980, p. P3 and June 3, 1980, pp. L9–10.

[7] See Committee on Scholarly Communications with the People's Republic of China Animal Sciences Delegation, "Animal Agriculture in China," especially chapters on animal breeding and genetics and chapters on swine and other individual types of animals. Washington: National Academy Press, 1980.

5. Grazing

Cattle are unlikely to become a major source of meat for most of the Chinese population in this century. They are generally inefficient converters of grain to meat, compared to pigs and poultry. The Chinese have began discussing development of their grasslands for grazing, but that is only possible in the long term. Even then it may not be efficient, because range feeding of cattle requires a long time and a large area per unit of meat and might have to be supplemented with grain feeding. A Chinese agricultural scientist[9] noted that Australia, which has roughly double China's grassland area and is one of the world's more efficient producers of range-fed beef, produces something over 2 million tons of meat per year. At the same level of efficiency, which would take many years to achieve, China could produce only a fraction of its meat requirements from grazing—the 1 million tons of meat produced per year would amount to only about 8 percent of 1980 meat consumption.

Most of the potential ranges are not located near population centers, meaning the meat would have to be frozen or processed in some other way and then transported. Use of grasslands for range feeding could also exacerbate North China's already serious ecological problems, including soil erosion and silting of rivers. Existing grasslands cover 286 million hectares, of which the Chinese consider 220 million usuable. However, some of the acreage now used has degenerated, with grass production declining.[10]

B. DAIRY PRODUCTION

China's dairy production is very low and is concentrated mostly near urban areas and on state farms in Heilongjiang. Milk production in 1980 was 1.141 million tons and all dairy products are frequently unavailable. Future development is likely also to be concentrated near cities to save transport costs and take advantage of possible economies of scale. Increased production would require investment in production and processing facilities and development of breeding and service programs like those needed for other livestock production.[11]

C. AQUATIC PRODUCTS

Production of fish has stagnated for years. Production levels in the 1970s were over four million tons per year compared to 1957 production of 3.12 million tons. Freshwater fish production has suffered from reclamation projects and various management problems; production has recently been around one million tons. Coastal fisheries have been damaged by overfishing. Further development in the foreseeable future will depend mainly on more freshwater production—which competes with crops for land and with livestock for feed—and on deep-sea fishing. The latter requires large capital investments in fishing ships and in storage and processing facilities. Even if production increases, however, transport and distribution are major constraints. All of this limits the possibility of rapid increases in fish consumption for the next decade.

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[8] Xinhua, Feb. 8, 1981, p. 13 and June 25, 1980, p. 26.

[9] Liu Shaobo of the department of animal husbandry of Beijing Agricultural University in Guangming Ribao, Nov. 11, 1979, p. 2.

[10] FBIS, Oct. 30, 1979, p. L9; Aug. 8, 1979, p. L13; Aug. 3, 1979, p. L4.

[11] FBIS, Aug. 7, 1979, p. L12; Feb. 1, 1980, p. L9; Nov. 26, 1980, p. 81; JPRS, 76723, p. 16.

V. Conclusion

For the short term, the recent increases in food production, and especially in meat and oilseed production, have given the Chinese some leeway. Supplies are now sufficient to allow rationing to be suspended, and to provide some time to prepare for long term sustained growth. Later in the decade of the 1980s growth in personal incomes is likely to be accompanied, especially in urban areas, by accelerated growth in demand for meat. Future prospects depend on how well the Chinese handle the necessary investments in the next few years. To increase per capita consumption enough to avoid imports and rationing would require a maximum Chinese effort in the three distinct areas of population growth limitation, grain production, and animal breeding and production. Energy constraints and financial limitations will prevent rapid increases in the inputs needed to produce enough grain domestically. In the first six months of 1981 nitrogen fertilizer production, for example, declined by 5.2 percent from the 1980 pace. Unless personal incomes are kept down demand for meat will outstrip China's ability to produce it using domestic resources. The most likely outcome, based on past performance and current planning and programs, is for moderate growth that would increase per capita consumption over time but will not entirely meet consumer demand as incomes rise. This will presumably result in higher prices and/or the reimposition of rationing in many places. In addition, larger amounts of grain will have to be imported for use as livestock feed.

Appendix

DERIVATION OF PRODUCTION BASED ESTIMATES

Table A-1 presents estimates of per capita consumption of various foodstuffs based on production, imports, and population. These data are used in Table I in the text.

TABLE A-1.—PRODUCTION BASED ESTIMATES OF CONSUMPTION

	Domestic production [1] (thousand tons per year)					Net imports [2] (thousand tons per year)				
	1955	1977	1978	1979	1980	1955	1977	1978	1979	1980
Edible oil	1,165	1,590	2,067	2,466	2,763	(3)	284	330	298	298
Sugar	717	1,816	2,276	2,500	2,570	86	1,598	1,299	1,096	1,096
Meat	3,985	7,800	(3)	10,624	12,055	(3)	(3)	(3)	(3)	(3)
Aquatic products	2,158	4,695	4,660	4,305	4,497	(3)	(3)	(3)	(3)	(3)
Fruit	2,500	(3)	6,590	7,250	(3)	(3)	−228	−261	−259	−259
Milk	(3)	(3)	(3)	1,070	1,141	(3)	(3)	(3)	(3)	(3)
	Per capita supply [4] (kilograms per year)					Total supply [5] (thousand tons per year)				
	1955	1977	1978	1979	1980	1955	1977	1978	1978	1980
Edible oil	1.92	1.98	2.50	2.85	3.12	1,165	1,874	2,397	2,764	3,061
Sugar	1.32	3.61	3.72	3.70	3.73	803	3,414	3,566	3,596	3,666
Meat	7.55	8.25	(3)	10.94	12.27	3,985	7,800	(3)	10,624	12,055
Aquatic products	4.14	4.97	4.86	4.43	4.58	2,518	4,695	4,660	4,305	4,497
Fruit	4.19	(3)	6.62	7.20	(3)	2,550	(3)	6,339	6,991	(3)
Milk	(3)	(3)	(3)	1.10	1.16	(3)	(3)	(3)	1,070	1,141

[1] 1955 figures are CIA estimates. Others were reported by the SSB, except for fruit (FBIS Dec. 3, 1979, p. L16) and edible oil (JPRS, 78324, June 18, 1981, p. 29). Oil in 1977 was estimated by reducing 1978 output by the ratio of 1977 oilseed output to 1978 oilseed output.

[2] CIA estimates. 1980 figures are assumed equal to 1979.

[3] Not available.

[4] Total supply divided by population (excluding Taiwan) reported by SSB

[5] Sum of domestic production and net imports.

Note: Negative net imports indicate exports are greater than imports

THE LIMITS TO AGRICULTURAL INTENSIFICATION: THE SUZHOU EXPERIENCE

By Thomas B. Wiens*

The main thrust of China's past strategy for agricultural development has been maximization of annual crop yields through further intensification of cultivation techniques. It is an emphasis which is broadly consistent with China's resource endowments—lack of unexploited arable land and surplus of labor. It also seems generally consistent with the peasants' goal of farm income maximization, because of an institutional framework in which labor is rewarded in workpoints rather than fixed wages and, at least in the past, a production technology which involved minimal dependence on the industrial sector. That is, the goals of the state and the peasant should be reasonably consistent.

But this consistency or harmony of objectives has unequivocably broken down in Suzhou Prefecture (an eight-county area in Jiangsu Province just west of Shanghai Municipality). The area is representative of the frontiers of high-yield, labor-intensive cultivation technology in the PRC. It is favored by natural conditions, abundant labor, developed mechanization, and a reliable irrigation and drainage system. The productive environment supports extensive use of compost, manure and other sources of recycled plant nutrient, but the area also receives relatively ample supplies of chemical fertilizers. Despite a short growing season (220-230 days per year), triple cropping[1] has become extensive in Suzhou (287,000 ha, or 75 percent of cultivated paddy area in 1978). Annual yields of unprocessed grain reached 11.5 tons/ha in 1978, of which 8 tons were rice and the remainder wheat, barley and naked barley (the "three wheats").

This paper summarizes some findings of a study of two production teams at the Baimao People's Commune, Changshu County, Suzhou Prefecture. The study sought to identify the optimal extent of triple cropping as opposed to double cropping in the area. At some risk of over-generalizing, this paper is concerned with the Government's implementation of agricultural development policy as seen from the perspective of a prosperous region of intensive farming. The main issue is how and to what extent can government policy contribute to growth of land and labor productivity in this and similar regions of China.

THE TRIPLE CROPPING CONTROVERSY

Three conclusions may be drawn about the intensification strategy as applied to Suzhou Prefecture: (1) The officially promoted vehicle for intensification, the expansion of triple cropping, has not led to increases in annual crop yields which are meaningful; (2) the current degree of intensity exceeds the level which would maximize farm incomes; (3) major increases in crop yields in Suzhou may no longer be possible. Of these conclusions, the second is widely acknowledged in China, although some Party cadres incorrectly blame this situation on farm management practice and/or government price policy. The third conclusion is not publicly acknowledged, nor has the focus of development strategy in the area shifted away from emphasis on crop yield increases. On the first conclusion, there is still a public controversy: although it has been acknowledged that errors were committed in the overexpansion of triple cropping elsewhere in central China, there has been reluctance to concede that this was also true in Suzhou.[3] But few agronomists, agro-bureaucrats or local cadres are supportive of triple-cropping, and some published criticisms of the system have been scathing.

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[1] Three crops per year, viz. barley-rice-rice, green manure-rice-rice, or rape-rice-rice.

In view of Suzhou's initially high crop yields, it is not surprising that the growth rate of prefectural harvests has fallen well-behind that of Jiangsu Province as a whole (2.2 percent vs. 4.1 percent per year since the mid-1960s; see Table 1). For Jiangsu as a whole, the growth rates of rice and wheat production since 1965 have been about equal, and have been accompanied by stagnation in miscellaneous grain production, largely due to conversion of upland to paddy. In Suzhou, however, rice production only grew 18 percent in 1966–78, compared to 96 percent for the "three wheats" (wheat, barley and naked barley), which have grown faster in Suzhou than in the province as a whole. Total growth of grain output did not exceed growth in population plus added seed requirements, so that the marketed surplus was essentially the same in 1966 and 1978.

Between the two bumper years of 1966 and 1978, there was a wholesale conversion to triple cropping (basically in 1971). An extra crop

TABLE 1.—SUZHOU PREFECTURE CROP STATISTICS 1966 AND 1978

[Production in millions of tons; gross yields in kilograms per hectare]

	1966	1978	Percentage increase
Gross grain production	3.042	3.940	29.5
Of which:			
Rice	2.604	3.080	18.3
Indica	.238	1.344	464.7
Japonica	2.366	1.736	−26.6
"Three wheats"	.439	.861	96.2
Barley	.114	.289	153.1
Wheat and naked barley	.325	.572	76.3
Marketed grain	1.201	1.225	2.0
Gross crop yields (sown acreage):			
Total grain	4,776	4,582	−4.0
Total rice	6,690	4,988	−25.4
Single crop rice	6,863	6,375	
Early d.c. rice	(1)	4,785	
Late d.c. rice	(1)	4,695	
"Three wheats"	1,770	3,555	100.8
Rapeseed	1,043	1,860	78.4

Not available.

Sources: Li Erhuang, 'Can't the Triple Cropping System Increase Yields in Suzhou?" "Guangming Ribao" June 20, 1979: 4. Zhang Liufang, "An Unrewarding Cultivation System Must Be Adjusted and Reformed," "Guangming Ribao" Dec. 30, 1979: 2. Zhu Genboa, "Some Views on the Triple Cropping System in Suzhou," "Jiangsu Nongye Koxue" No. 4, 1979: 4–7. Huang Bingfu, "More Views and Opinions on the Cultivation System in Southern Jiangsu," "Renmin Ribao" Mar. 15, 1979: 2.

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[3] Although following the poor 1977 harvest and before the public controversy arose, some reduction in triple-cropped area was officially condoned in parts of the Prefecture.

per year naturally caused a decline in grain yields on sown acreage, especially rice yields, but a modest increase in gross annual grain yields: annual yields of paddy rice rose 19 percent, from 6.7 to 8.0 tons/ha. As one views the gross yield series of the late 1960s (Figure 1), noting the stagnation in rice yields after 1966 and the impact of the changeover in 1971, moving to triple cropping seems to have been a sensible strategy.

FIGURE 1. Suzhou Prefecture Rice Yields by Variety, 1964–1972.

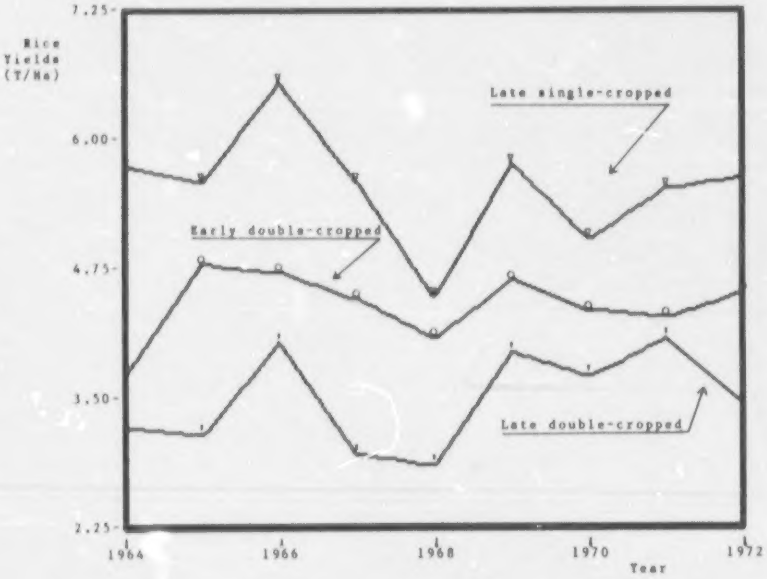

TABLE 2.—ESTIMATE OF INCREASE IN SUZHOU GRAIN PRODUCTION ATTRIBUTABLE TO CONVERSION TO TRIPLE-CROPPING, 1966–78

[In millions of tons]

Adjustment	Amount
1. Total gross grain increase	0.898
Less:	
2. "Three wheats" increase	−.422
3. Wheat yield opportunity cost	−.013
4. Additional cultivated acreage	−.221
5. Additional seed requirements	−.128
6. Lower milling rates	−.118
Equals:	
7. Increase attributable to triple-cropping	−.004

Sources: 1–2: Table 1. 3–6: See text for explanation; estimates from Chinese press.

But, as the critics of triple cropping now point out, looking at gross yields alone is a mistake. In retrospect, the one-shot increase in gross yields made little or no contribution to net product. Some necessary adjustments are indicated in Table 2, in order to arrive at the net gains attributable to triple cropping: of the total increase in gross grain production, one should deduct (1) the increases in "three wheats" production, which are due to other factors, especially drainage improvement, not to the addition of a rice crop; (2) the opportunity cost of foregone yields due to the changeover from wheat to barleys as winter crops (wheat is higher yielding, but too long in duration to fit into triple-cropping sequences); (3) grain increases due to conversion of upland (formerly in non-grain crops) to paddy; (4) additional seed requirements due to an additional crop per year; and (5) reduced net product after milling, because of the substitution of barley for wheat and Indica for Japonica varieties, both necessitated by triple cropping. The adjustments indicate that, had the changeover to triple cropping not occurred, net grain yields (after seed and processing losses) would still be the same today. In other words, the increased gross yields were not meaningful.

The second conclusion—that emphasis on triple cropping is unprofitable to farmers—is easily verified from the comparison in Table 3. The comparison properly ignores labor costs—population density in Suzhou on average is high enough to permit nearly 100 percent triple cropping with only a brief, if bitter, seasonal labor supply bottleneck. Yet cash costs of inputs—especially chemical fertilizers—required in triple cropping exceed those in double cropping by one-third. There is a certain irony here: during the Great Leap period, when triple cropping was first pushed on a reluctant peasantry, the added cash costs were not a major issue, for want of industrial inputs; but it was the absence of those inputs—chemical fertilizer, plastic sheet, walking tractors, reliable powered irrigation and drainage—which at the time made triple cropping really infeasible, and forced the government to draw back from its promotion. When the availability of these inputs made triple cropping feasible in the early 1970s, the added cost also made it unprofitable. Thus the divergence between the interests of the state in yield maximization and those of the farmer in income maximization arose.

If this divergence is now widely recognized in China, why do officials continue to support the yield-maximizing strategy instead of favoring income maximization? The usual answer is that any reduction in yields would force greater imports of grain, and the world market couldn't sustain such a burden at reasonable prices. It is also implied that the terms of trade of grain for industrial inputs are still relatively unfavorable in China compared to border prices; if Chinese farmers were to reduce their intensity of cultivation in the pursuit of profit maximization, world grain prices could be driven up sharply and the disparity would be even more striking. In other words, current prices give misleading signals. This is one reason for Chinese reluctance to allow full freedom of decisionmaking for enterprises such as production teams.

However, this problem should not be exaggerated. Marginal grain prices—i.e., above-quota prices—are no longer out of line with those in most other Asian countries, and since quotas have not been changed for a decade, they should have little impact on farm-level incentives to increase production. Increased retention now accompanies increased

TABLE 3.—COMPARISON OF MAJOR CROP SEQUENCES UNDER VARIOUS CRITERIA: AVERAGE, EAST NO. 1 AND NO. 6 TEAMS

	Barley-rice-rice	Wheat-late s.c. rice	Rape-late s.c. rice	Wheat-middle rice	G.m.-rice-rice
1. Gross yields (tons per hectare)	11. 15	9. 85	9. 69	10. 80	9. 38
2. Seeds	. 68	. 37	. 17	. 37	. 52
3. Net yields	10. 46	9. 48	9. 52	10. 43	8. 86
4. Milled product	8. 34	7. 81	7. 84	8. 30	7. 02
5. Gross value (yuan per hectare) of:					
Main product	2, 872. 50	2, 827. 95	2, 777. 25	2, 849. 55	2, 406. 60
Byproducts	213. 15	270. 15	214. 35	238. 95	238. 95
Above-quota premium	386. 85	290. 40	328. 50	391. 80	179. 70
Total	3, 472. 50	3, 388. 50	3, 320. 10	3, 480. 30	2, 771. 10
6. Total costs	1, 823. 40	1, 369. 65	1, 648. 95	1, 395. 45	1, 443. 15
7. Net revenue	1, 649. 10	2, 018. 85	1, 671. 15	2, 084. 85	1, 327. 95
8. Net revenue per gong	. 95	1. 56	1. 16	1. 58	1. 02

Sources:

1. 1979 normal yields of rough grain. Rapeseed converted to grain-equivalent based on relative prices of rapeseed and wheat. Because commune cadres insisted that early rice yields at least 0.45 t/ha more (because of earlier planting) in the g.m.-rice-rice sequence than in barley-rice-rice, the estimates of normal yields for these 2 sequences were adjusted upwards and downwards respectively to maintain this difference.
2. Average 1979 requirements for both teams. For hybrid middle rice, value of seed purchased converted to equivalent quantity of late s.c. rice seed. Rapeseed converted as noted above.
3. Gross yields minus seed requirements.
4. Computed from 3, accorded to reported milling rates for each crop (although the barleys are rarely milled) Rapeseed grain-equivalents converted at rate for wheat.
5. Computed at official within-quota purchase prices for main product as given in 1; at internal transfer prices for byproduct (since only a small amount may be sold to the state). The above-quota premium is computed by subtracting from net yields in 3, an additional amount representing the total of the basic quota, PC members' rations, and feed supplied by the team in support of private hog raising and for a plow ox, all expressed on a per hectare basis (the rapeseed quota, converted to grain-equivalent, was handled separately according to the same principle). The remainder in a normal year (when net contributions to reserves should be nil) could be sold at above quota prices hence a premium equivalent to 50 percent of the average price of grain (computed for each cropping sequence at within-quota prices) is applied to the remainder to reflect the extra value of potential above-quota sales.
6. Costs excluding labor and including seeds, chemical fertilizer, rice straw, payments for private hog manure, plant protection, plow ox maintenance, machine plowing fees, water and electricity, plastic sheeting, repairs and depreciation of machinery and boats, and other inputs. In addition, we have added cost estimates for collective manure used in each sequence, exclusive of labor (at 2/3 of price paid for private manure, which includes labor compensation); green manure included in compost applied, at cost of production excluding labor. Because gross value of g.m.-rice-rice does not account for value of green manure, its production costs have also been excluded from computation.
7. Total gross value in 5 minus costs in 6.
8. 1 gong equivalent to about 6 hr. of labor.

production, and free market sales (or sales at equivalent prices to the government) are now permitted. As free market prices average 10–20 percent higher than above-quota prices, this also contributes to incentives. It is therefore questionable whether farmers would always deintensify if given the option. Moreover, as in the case of triple-cropping, deintensification might increase net yields. Income-maximization models of the two Suzhou teams suggest that even gross yields could increase if full freedom of decisionmaking were allowed.

FREEDOM OF DECISIONMAKING

The direction of movement of national policy over the last few years has been towards greater freedom of decisionmaking for the production teams, and lately toward decentralizing management within the production team to smaller groups or individual families. To what extent has this been realized in Suzhou (and specifically at Baimao People's Commune)?

In general, areas as prosperous as southern Jiangsu, where the management of farming at the production team level has been relatively successful, are much less affected by these changes in policy than poorer or more backwards areas. The more radical changes in rural institutions cannot be found in the prosperous areas.

In fact most formal restrictions on decisionmaking which have existed in the past continue apparently unchanged. Separate quotas for grain and rapeseed, fixed per capita rations for each, rules regarding feed and reserve set asides, etc. leave few choices in the broad nature of the product to be produced and how it is disposed of (see Table 4; in a good year such as 1979, the availability of unusual surpluses for sale at above-quota prices may give a false appearance of greater potential flexibility, but these cannot be predicted in advance). Similar restrictions apply on the input side—nitrogenous chemical fertilizer, the most important input, is made available for purchase according to an intricate incentive *cum* rationing scheme.

Choice among crops is an area in which state intervention continues to be felt. The waxing and waning of state pressure to triple crop can be seen in Table 5, but even with two teams scarcely a mile apart, and members of the same brigade, there are differences in acceptance/resistance observable in past behavior. These may be explained by differences in the strategies or political abilities of the two team leaders.

TABLE 4.—DISTRIBUTION OF GRAIN AND RAPESEED: EAST NO. 1 AND NO. 6 TEAMS, 1979

[In kilograms of unprocessed product]

	East No. 1	No. 6
1. Total grain	136, 400	226, 330
Of which:		
1978 carryover	11, 024	18, 043
1979 production	125, 376	208, 287
2. Sales to state	57, 273	128, 253
Of which:		
Basic quota	37, 937	70, 928
Above-quota sales	19, 336	57, 325
3. Rations (kouliang)	30, 705	52, 440
4. Seed	5, 174	5, 567
5. Feed	24, 086	36, 754
Of which:		
Collective	16, 242	25, 656
Individual	7, 844	11, 099
6. Reserves	14, 163	3, 317
7. Other uses	5, 000	0
8. Total rapeseed	2, 310	3, 477
Of which: Sold to state	1, 446	2, 223
Of which:		
Quota	511	1, 076
Above-quota sales	935	1, 148
Distributed	805	1, 133
Seed, etc	59	121

1. 1979 production figures as reported here include some beans from field borders not reported in acreage, yield, and production figures.

Note: Sums may not add to totals due to rounding.

TABLE 5.—TRIPLE-CROPPING RATES IN EAST NO. 1 AND NO. 6 TEAMS, 1970–80

[Percentage of acreage in final rice crop]

	East No. 1	No. 6
1970	29. 2	30. 5
1971	50. 6	75. 5
1972	52. 8	62. 9
1973	48. 3	61. 1
1974	47. 5	39. 8
1975	48. 4	55. 9
1976	51. 2	63. 8
1977	46. 9	64. 6
1978	41. 5	44. 3
1979	45. 6	45. 2
1980	33. 4	38. 8

It is notable that the first major cutback in triple cropping occurred in the 1978 crop year, before the subject was broached in the press and presumably reflecting initiatives at higher administrative levels, not by the production teams. This also coincided with state promotion of hybrid rice, grown locally only within the double-cropping scheme. Still, in 1980, when commune and county cadres argued that further cutbacks in triple cropping were not required, the teams were still cutting back. And East No. 1 team was also reducing its hybrid rice acreage while other teams in the commune were not. In sum, it appears that choice of cropping system was always a matter on which there was some flexibility, and this increased significantly in 1980, but teams were not yet in a position to abandon triple cropping even if they so desired.

A second instance is the choice between raising collective pigs at the expense of collective feedgrain, which could otherwise be sold to the state. By my calculations, collective pig raising is a significant loss item to teams, far outweighing misallocation among crops. It is a greater loss when, as with No. 6 team, state restrictions on use of feed grain are followed strictly and forage is substituted for grain (see Table 6). This practice may earn a team commendation as a model unit (this may have some economic value), but is uneconomic, since in the end, each kilogram of meat produced costs more in terms of grain. One team showed some acumen in evading state restrictions on feedgrain setasides by buying extra fine feed for its pigs, thus reducing its unit costs. But the problem here is primarily state pricing policy—the pig-to-grain price ratio averages 43 percent higher in other developing countries, and collective pig raising would be profitable if the same ratio prevailed in China. In effect, the Government is levying a very high tax on peasant meat production. Here, too, indications are that the teams are now freer to cut back, in view of a 20–30 percent decline in the value of collective pigs in stock of the Baimao teams in 1979–1980, but if they were free to do so, surely they would abandon it entirely.

TABLE 6.—DIFFERENCES IN FEEDING PRACTICES IN COLLECTIVE PIG RAISING BETWEEN EAST NO. 1 AND NO. 6 TEAMS

[In kilograms, except where otherwise noted]

	East No. 1	No. 6
1. Fattening period (months)	6	9
2. Weight increase per pig	71.5	60.5
3. Grain conversion ratio (kilograms per kilogram weight increase)	2.63	3.78
4. Total concentrate conversion ratio	3.30	3.78
5. Weight increase per day per pig	0.40	0.23
6. Feed grain per pig per day	1.04	0.85
7. Concentrate per pig per day	1.31	0.85
8. Cost of forage and fodder per kilograms of weight increase (yuan)	0.29	0.43

1. As reported; after weaning.
2. Average weight of meat pigs at slaughter minus average weight of shoats at sale.
3. Computed from team data: for fattened pigs, total nominal grain consumption times ratio of actual to nominal for entire enterprise, divided by total weight gain.
4. As in note 3, except ratio of total concentrate to nominal feedgrain used in estimation. No. 6 used no additional concentrate.
5. Line 2 divided by 30 days times line 1.
6. Line 5 times line 3.
7. Line 5 times line 4.
8. Total value of forage and fodder, including processing, at opportunity cost, as estimated, divided by total weight increase for shoats and fattened pigs, as derived from team data.

Further moves in the direction of greater decisionmaking freedom present serious policy problems for the government. Consider some policy options:

(1) Abandonment of the quota system, allowing a uniform administered price to prevail for each product: the quota system in effect represents a large, hidden tax on agriculture, which would have to be replaced with an explicit tax, presumably through reappraisal of normal yields and raising the land tax rate. Would this be preferred by the peasantry to the quota system, or does making the tax explicit also make it less bearable? A temporary problem would be the ensuing adjustment of cropping proportions among grain, oilseeds, fibers, etc., but relative prices of crops are not far out of line with those in other developing countries, so that small and repeated price adjustments should allow a quick restoration of the status quo ex ante.

(2) Drop the restrictions on retention of grain and other products, and allow all sales to be voluntary: To give the government time to adjust administered purchase prices without a destabilized flow of grain from farm to city, it would have to make supplementary purchases on the free market (as it does now) and allow sales by teams on the free market (still not permitted for major crops in most areas). Administered prices would have to be increased, and would force further increases in urban wages, decreased industrial profits, and/or increased government deficits if direct taxes on the peasantry were not simultaneously increased.

(3) Abandonment of administrative pressures for selection of particular crop proportions: with retention of quota and ration systems, the effect usually would be benign. In Suzhou, double cropping would be restored even more rapidly, probably with greater use of hybrid rice.

(4) Abandoned pressure for collective pig raising: either a major price increase accompanied by imposition of a direct tax, or else some form of above-quota pricing scheme for pigs which discriminated in favor of collective pig raising would be required if a decline in total meat production were not to result. If these were introduced, the effects on quantity and efficiency of pig production could be quite positive. Alternatively, the state could funnel the released feedgrain into modern pig raising enterprises, if these could be shown to be more efficient than small-scale collective enterprises.

(5) Abandonment of restrictions on input purchases, including incentive schemes which tie input supplies to sown acreage levels, pig sales, and above-quota grain sales: with nitrogenous chemical fertilizers, the supply of which is now rather ample (at least in Suzhou), the incentive schemes no longer appear effective, and the current allocation system encourages excessive purchases by many teams. The last is also true of farm machinery. Currently the Baimao teams purchase as much fertilizer as they are allocated, even when they believe the extra fertilizer adds nothing to output. It is unclear whether this is due to force of habit, or whether pressure continues to be applied to insure that purchases equal allocations. In any case, a market allocation system would increase efficiency with few negative effects.

In sum, there remain a few changes in the direction of greater freedom of decisionmaking which would be painless, such as those described in (3) and (5), but abandonment of direct administrative intervention in farm management would require both major changes in the institutional structure and a painful adjustment process which would challenge the government's ability to control supply and demand.

However, the production teams are not as well equipped as they might be to take advantage of such independence, if offered. Peasant farms outside China are generally single-family, owner-managed units, and profit and loss are not abstract concepts but something felt intimately by the head of household. In Chinese production teams, accounting is a specialized, if part-time, function of a single member, and the accounts are no more than journals used in totalling up the year's receipts and disbursements for determining the distribution and reporting to higher authorities. Because of the mix of accounting, quota, and above-quota prices used to evaluate entries, and the current crude categories of aggregation, the team cannot evaluate the profitability of any single crop or other activity, even though all the raw data required may exist.

Even in a matter such as the allocation of inputs among crops, where teams now have nearly complete freedom of action, some shortcomings can be found which reflect failures of the extension system. For example, the technical literature of China recommends that phosphate applications emphasize the winter crops, whereas the Baimao teams were emphasizing the summer crops. The new hybrid rice is known to have heavy nutrient requirements, but the teams were treating it just like the traditional late rice crop in their allocations of fertilizer. This does not imply that production teams are poorly managed; merely that even well-managed teams need help in improving their management techniques if greater decisionmaking freedom is to result in higher productivity.

Sources of Productivity Increase

Although the Suzhou area historically has been high yielding, clearly the last few decades have seen substantial gains in land productivity. For instance, grain yields on sown area at Baimao appear to be about three times the average for Changshu county in the 1930s. Without detailing the sources of these increases, Suzhou (and Baimao) has benefited from major changes in technology and greatly increased availability of industrial inputs seen elsewhere in south China. But the prospects for further and equally rapid productivity gains appear dubious.

Historical yield increases in Suzhou have been accompanied by increased absorption of labor in farming, so that labor productivity has not increased very fast even measured in terms of gross yields per worker. Labor "requirements" in cultivation (Table 7) today seem extremely high, at 370 days/ha for wheat/barley, 495 for rapeseed, and 509 for single-crop rice. Historical data for Changshu county suggests that labor intensity per sown hectare in rice cultivation roughly doubled between the 1930s and 1958, and increased by one-fourth over the next two decades. Labor intensity of winter crops did not increase significantly until after 1958, after which it more than doubled. Aside from the additional labor absorbed as a result of the introduction of triple cropping and azolla cultivation, paddy rice absorbed no additional labor during the past two decades, whereas the winter crops, which had been neglected in the past, absorbed much increased amounts of labor in organic manure collection, transport and application, chemical fertilizer use, and plant protection (activities which virtually were non-existent for winter crops in the 1930s).

TABLE 7.—LABOR REQUIREMENTS BY CROP AND ACTIVITY: AVERAGE OF EAST NO. 1 AND NO. 6 TEAMS, 1979

[In hours per hectare at 6 hr per gong]

Activity	Wheat, barley	Rape	Green manure	Early rice	Late rice	Single rice
Total	2,961	3,960	567	4,860	3,690	5,085
Of which:						
1. Organic fertilizer	518	180	0	1,440	900	1,305
Of which:						
(a) Accumulation	347	(1)	0	261	675	1,044
(b) Transport, preparation				963		
(c) Application	171	(1)	0	216	225	261
2. Seedlings preparation	0	180	0	383	270	180
3. Land preparation and sowing [2]	563	585	203	180	225	180
Of which:						
(a) Ditch digging	180	(1)	(1)	(1)	(1)	(1)
(b) Other	383	(1)	(1)	(1)	(1)	(1)
4. Transplanting [3]	0	1,440	0	900	383	1,260
Of which:						
(a) Leveling plus azolla	0	0	0	na	0	383
(b) Transplanting	0	1,440	0	na	383	383
(c) Azolla turnover	0	0	0	0	0	495
5. Chemical fertilizer	338	648	90	68	90	90
Of which:						
(a) Deep application	203	135	0	0	0	0
(b) Top dressing	135	513	90	68	90	90
6. Plant protection	90	252	0	585	563	765
7. Irrigation/drainage	180	0	0	90	90	90
8. Crop management [4]	189	0	0	225	315	270
9. Harvesting, etc. [5]	945	675	270	968	855	945
Of which:						
(a) Harvesting, threshing	765	(1)	270	653	(1)	(1)
(b) Transport, drying	180	(1)	0	315	(1)	(1)
10. Other	135	0	0	0	0	0

[1] Not available.

[2] Including application of chemical fertilizer as base fertilizer, except deep application.

[3] Including azolla spreading, field leveling, and azolla turnover.

[4] Including earth compressing (wheat/barley), draining, weeding, and baking of paddy fields; general weeding; and the pulling of tall weeds.

[5] Green manure seed fields require an additional 333 hr/ha for harvesting and threshing.

Note: Above figures are based on averages by activity of reported work day requirements (in gong equivalent to about 6 hrs of work). Team leaders agreed that actual labor by activity did not differ between teams.

Labor intensity in Suzhou rice cultivation is especially startling in comparison with foreign norms—roughly 2.65 times the average in Japan in 1955 (over six times that in 1975), and 3–4 times as much as a typical Philippine farm today (on a per sown hectare basis; higher again if compared on the basis of labor per cultivated hectare!) Interestingly, labor requirements in such basic operations as land preparation and sowing, transplanting (excluding levelling and azolla use), weeding, harvesting, threshing, hauling and drying are comparable to those of Philippine farms. But in other categories, such as organic fertilizer use, seedlings preparation, levelling plus azolla use, chemical fertilizer application, plant protection, and irrigation management (all told accounting for two-thirds of total labor), the Philippine farmer commits little or no labor. These are mostly operations performed at other than the busiest periods, so that the labor's opportunity cost may be very low. And one cannot assume that this additional labor is unproductive or unwarranted, since yields for the Baimao teams for single-cropped rice average around 6.4 tons/ha, compared to 2.5–3.5 tons/ha for the Philippine farmer and 3.9 tons/ha in Japan in 1955.

Could land and labor productivity be improved on with the current technology? Some tentative answers can be obtained from the results of solutions of (linear programming) optimization models for the two Baimao teams. Without discussing the details of these models, the major findings are as follows:

(1) Given current prices and constraints on input levels, neither crop yields nor gross revenues can be significantly improved on through a change in mix of existing activities. If teams were free to abandon triple cropping and especially collective pig raising, it would be possible to improve net revenues by 12–25 percent (with a 16–33 percent increase in distributed income), but some of this would come at the expense of the state, as hog marketing would decrease and state purchases of grain at high above-quota prices would increase.

(2) Although at Baimao labor shortage limits the extent of triple cropping, increased labor would not make triple cropping more desirable, and could add only 4–8 percent to net revenues (through modification of crop mix and/or increased use of organic fertilizers). In Suzhou as a whole, where the labor/land ratio is twice that at Baimao, the marginal product of labor in farming must be presumed close to zero.

(3) Nitrogenous fertilizer is already in surplus at Baimao, and increased supplies of N alone would not increase product. But phosphate and especially potassium are badly needed, and could conservatively add at least 5 percent on top of the net revenues gained by dropping collective pig raising and triple cropping. Yields would increase slightly above current levels, and there would be a tendency to cut back organic fertilizer use, releasing labor.

In short it seems that improvements in allocative efficiency and further chemicalization of Suzhou agriculture could do much for peasant incomes, but less for the state, especially if collective pig raising is viewed as an activity from which the state profits at the expense of the peasantry.

Could mechanization change this picture? In Suzhou, mechanization is viewed primarily as a solution to the labor bottlenecks limiting the extent (and yields) of triple cropping, and since triple cropping does not seem advantageous even when these bottlenecks are removed, its urgency is questionable. Moreover, the most commonly voiced need is for a viable rice transplanter, but the technical problems of mechanizing late rice transplanting have proven insuperable to date.

To round out this analysis, two other elements must be added: First, in recent years yields of winter grain crops have been climbing at a rate which contributed just under 2 percent per year to total growth in grain production, reportedly due to improvements in drainage, greater input use, and increased managerial attention. There is no indication that this source of productivity gain has been exhausted. Secondly, the introduction of hybrid rice in this region has not only undercut the advantages of triple cropping, but also may have opened new potential for increases (and greater stability) in rice yields. It is clear that in Suzhou and elsewhere in south China, the breeding and production of hybrid seed varieties and crop management in cultivation have not yet been mastered; the enthusiasm of 1977–79 for the hybrids has cooled somewhat. If these problems are overcome, the yield advantage of hybrid rice may increase and acreage could reach two or three times current levels (to 50–60 percent of paddy acreage). The impact of this change, however, has largely been accounted for in the gains in output projected from the LP model solutions described above.

DIRECTIONS OF FUTURE DEVELOPMENT

The implications of the above discussion are that growth of land productivity on the order of 2–3 percent per year and a faster growth rate of net farm incomes are still conceivable for a region as high-and-stable yielding as Suzhou, primarily because drainage conditions still fall short of the ideal. But this growth is in underlying, "normal" productivity, and it may be some time before the bumper yields of 1978–79 are again surpassed. Moreover, it presumes a relaxation of pressures to adopt particular cropping systems, efforts to increase the advantages of hybrid rice, and greatly increased supplies of chemical fertilizers other than nitrogen.

While pursuing the above, it should be recognized that the main thrust of long-run development strategy in this and similar regions must turn toward increasing labor productivity, and this does not involve further intensification of cultivation technique but rather the reverse. It involves "walking on two legs", a dualistic development program, emphasizing the growth of rural industries which absorb labor and reduce its surplus. I would mention Wuxi county as a model for such a program if this county had not simultaneously reduced labor productivity and indeed total productivity in cultivation by imposing an extreme extent of triple cropping on its production teams. Rather, the agricultural leg requires a gradual replacement of traditional production inputs with inputs produced by industry while maintaining the highest possible net revenues per hectare (still ignoring labor cost except during the busiest season). The pace of this process is set by the rate of labor absorption by industry, and may be very slow.

If agricultural development in this region is ever to raise labor productivity and incomes, its technical content must take much the following form:

(1) Triple cropping is rapidly replaced by double cropping on all but a small proportion of acreage. There is further growth in the importance of hybrid rice, until a new generation of seeds which shares its characteristics of high yields and sparse planting can take its place. These developments alone would slightly increase net yields, greatly increase profitability, and reduce overall labor requirements.

(2) Potash is introduced, phosphate and secondarily nitrogenous fertilizer supplies are increased. Azolla is abandoned and green manure and winter fallow acreage is replaced with winter grains as drainage conditions are improved. Composting is gradually replaced by direct plowing-under of straw and green manure and applications

of pig manure. These developments raise yields, increase productively-cropped acreage, and save tremendous quantities of labor at the expense of increased cash production costs.

(3) The process described above should not outpace the ability of rural industry to absorb labor. When the latter is well enough developed to make the continued existence of sharp peaks in labor requirements in cultivation an expensive proposition, mechanization would become economic. Windrow harvesters and paddy rice transplanters (an improved version, borrowing from Japanese innovations) could be introduced. This stage is a long way off for most of Suzhou, but will come sooner for areas where the labor/land ratio is low (as at Baimao).

Some elements of this scenario are debatable or assume solutions to problems which are currently pressing (such as the shortage of capital and appropriate technologies on which to base rural industrialization). The projections express a conviction that in Suzhou, the Chinese strategy of yield maximization through intensification of cropping and labor use has at once reached its highest state of development and the end of the road. Further development of Suzhou agriculture means a retreat from this approach, and movement toward the kinds of modern agricultural practice found today in Japan, South Korea, and Taiwan.

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3. SCIENCE AND TECHNOLOGY

SCIENCE, ELITISM, AND ECONOMIC READJUSTMENT

By Leo A. Orleans*

OVERVIEW

In looking at the course of China's development in the past three decades it is interesting to speculate whether Mao was especially perceptive in his philosophical affirmation that all progress occurs in waves rather than in a straight line, or whether it was Mao himself who, for ideological reasons, was responsible for making the waves which made it impossible to pursue a more even growth. While few people are likely to accept this Mao-given maxim as a law of economic development, nevertheless the fluctuating pattern has continued in China—not only since Mao's death but even since the demise of the "gang of four"—albeit for quite different reasons.

Science and technology were in no sense immune from the political drifts and every wave-like advance was indeed followed—just as Mao predicted (insisted?)—by a discovery of contradictions, which necessitated a reevaluation of the previous policies, and then a retreat. The fluctuations continue. An enormous scientific and technological wave crested in 1977 and 1978, when, because science and technology were to spearhead the Four Modernizations, China announced some extremely ambitious goals that incorporated expensive projects and plans in a variety of fields. The wave hit on some contradictions in 1979 and 1980. Specifically, the authorities had disregarded shortages in scientific and technical manpower and serious financial constraints. They now admit that they were too impetuous, were deceived by "expectations for easy success," and had an "inadequate understanding of China's reality." Thus, the wave began to recede. But another wave of a different size and configuration is already cresting. Now Beijing maintains the basic problem in the past was a lack of coordination between scientific and technical work and economic work. Under the present policies of readjustment and reform, more attention will be devoted to the "problems of application and development in science and technology." There will be less basic research and much effort will be expended toward "absorbing foreign production techniques suitable to our own national conditions." To accomplish this task Beijing is insisting on much closer contacts between scientific research institutes and production enterprises.

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*The author does research on China for the Congressional Research Service. I would like to thank Leonard Bruno, Alex DeAngeles, Tom Fingar, Howard Klein, Pierre Perrolle, and Chi Wang for reading and commenting on this paper. Unfortunately, not one of these "friends" is willing to share the responsibility.

In fact the Chinese are emitting two different signals. On the one hand, the May 1981 election of a scientist to head the Chinese Academy of Sciences and the delegating of policy-making responsibility to the Scientific Council of the Academy, suggest scientists will exercise more leadership over scientific research than ever before. On the other hand, national economic policies of readjustment and reform tell us a somewhat different story. It seems that scientific priorities will once again be determined generally by political choices as defined by national interests. This more probable message suggests that China does not yet have the luxury of pursuing a policy which would assure complete laissez-faire for scientists in selecting research topics. This in no way implies a return to the "pre-gang" period. Leadership of research institutions has gradually shifted from individuals who had achieved their position under earlier political criteria and who brought with them such traditional virtues as conformity, obedience, and loyalty—not exactly the standard prerequisites for scientific ingenuity. It is now essentially in the hands of scientists and engineers who will undoubtedly still make inputs into subjects for research and into budgetary decisions, but political rationality will usually supersede analytical rationality.

The Chinese clearly state their intention to introduce advanced technology from abroad and, given the political and strategic considerations on both sides of the Pacific, it is not unreasonable to assume that through increased economic cooperation and trade, an ever-growing share of this technology will come from the United States. The government-to-government science and technology agreements between the two countries, signed in January 1979, opened the doors for scores of private institutions and businesses to develop their own cooperative programs with Chinese institutions and enterprises. An average of 140 Chinese commercial, technical, and cultural delegations per month visited the United States in 1980. Significant benefits have been gained through cooperative ventures and 14 science and technology protocols have been negotiated under the umbrella of the Science and Technology Agreement. Nevertheless, since there is some ambiguity both about the direction of China's policies in science and technology and the priority that the United States may place on future cooperation in these fields, it is important to remember that in the past such contacts have had ramifications that extended well beyond science and technology. Science and technology represented the "foot in the door" of U.S.-China relations and have played a vital role in expanding not only social, cultural and economic contacts, but also in greatly enhancing the political understanding between the two countries. It is, therefore, not an exaggeration to suggest that in the case of science, the importance of the "by-product" may have exceeded the importance of the "product" itself.

PATHS TO SUCCESS: CHINA AND THE UNITED STATES

The problems in science and technology with which China has been struggling over the past few years appear to be characteristic of a nation striving to achieve rapid modernization with limited resources. Since earlier efforts to solve them have inevitably been disrupted by political upheavals, most of the basic problems which concerned the country in previous decades are still in the process of being resolved and, having lived through the unhappy period of the Cultural Revolution and its aftermath, Beijing's emphasis is once again on making up for lost time. How best to organize and manage the scientific establishment? How to allocate the science budget? What priority should be given to basic versus applied research? How to train and best utilize the scarce scientific and technological manpower and how to coordinate scientific research with China's economic needs? These and other questions that relate to the "fourth modernization"—to science and technology—are fully discussed in the Chinese media and analyzed by foreign observers. There is, however, an important issue which is seldom raised, in part because of its sensitivity and in part because there are no clear-cut answers to the questions which might be raised. It has to do with the influence of China's scientific elite on policies in science and technology and with the possibility that this influence is not always in harmony with the country's broader national goals and aspirations.

The antagonism which characterized relations between the Chinese Communist Party and China's higher intellectuals is well known. The superior qualifications and abilities—especially of the scientists—have always been recognized as indispensable to nation building, but professionals' insistence on independent intellectual thought is anathema to Party supremacy in all spheres and to the requirement for ideological orthodoxy. Over the years there have been many shifts in the relations between the State and the scientists and it seems that even now the restless Chinese pendulum continues to swing. By 1978 scientists, so deeply scarred by the Cultural Revolution, returned to a position of strength and authority in China—a most basic prerequisite for modernization. It appears, however, that in their rapid ascent in the post-"gang" years, the higher echelon of scientists has tended to revert to an elitist and isolated position of the traditional Chinese intellectual and by 1980 one could sense some disillusionment on the part of the policy-makers with the attitudes and demands of the scientific community. There is a realization that, important as they may be, perhaps science and technology are not the panacea for all of China's ills, after all, and therefore require some restraint.

The quick rise and recent downturn of the influence of the Chinese scientist prompt some important questions. They are questions that are especially difficult to ask so soon after the Cultural Revolution, with its unmerciful attacks against the "ingrained bourgeois individualism" of intellectuals in general and scientists in particular. Is it possible that there was a basis for at least some of Mao's accusations against the scientists? Is it indeed an ingrained characteristic of the scientists to want to build their own "independent kingdom"? Is it fair to suggest that while scientists may no longer live in ivory towers, as claimed by Mao, they don't care to venture too far from the protective walls of these towers? Can today's China accommodate a conspicuous return to the historical dichotomy between the man of learning and the rest of the society? And who should know more about the subject than Fang Yi, China's top administrator of science, when he wrote that "in our scientific research organs and social circles the practice of egalitarianism poses a serious problem"?[1]

A degree of scientific exclusiveness is a universal phenomenon—and up to a point it is supported and perpetuated by all of us. But why should the dichotomy between the man of science and the rest of society be greater in China than in the United States, for example? Socialist nations may accuse the United States of capitalist exploitation and sharp socioeconomic distinctions but, in fact, elitism of any sort—including scientific elitism—is moderated by our history, religious traditions, and social attitudes and pressures. Furthermore, American scientists are just as likely as anyone else to have a proletarian heritage—which they not only remember, but often wear as a badge of distinction.

Conversely, despite being pounded by propaganda expounding egalitarian theories for thirty years, China is still anything but a classless society. In part it is a characteristic of all Third World countries in which it is extremely difficult to cross over classes and where advanced education is essentially reserved for the offspring of those segments of society already enjoying some cultural and economic advantages. In China, the Cultural Revolution clearly demonstrated the fallacy of the theoretically attractive notion that given the opportunity, the peasant youth should be able to achieve as much as an urban youth of a more advantaged background. The failure of this experiment probably only reinforced the strong class consciousness, ever present in the Chinese society, and the tradition, inadvertently reinforced by some of Mao's policies, of transmitting class background from one generation to the next. Furthermore, in the past few years there has again reappeared a clear-cut distinction between mental and manual labor—a distinction which is now considered to be "natural" and justified as the inevitable consequence of historical progression and not as an aspect of capitalist exploitation.

Now, let us pursue the U.S.-China comparison from another perspective. In the United States, as in other advanced capitalist nations, much of the distinction between science and technology has been blurred. As pointed out by Hendrick Bode, today's technology requires a thorough and fundamental understanding of a situation by procedures similar to those of pure science. "Seen in this perspective," he says, "technology appears as a natural extension of science, rather than as something essentially different."[2] In China, there has been an extremely uneven progress of the various fields, but in general, because of the much lower level of development, the gap between science and technology is still very wide. These differences have a direct bearing on career perceptions in the two countries.

In the United States, a young science graduate with his new diploma has a variety of options within which he can pursue his particular interests. His career in research can develop just as successfully whether he chooses to pursue it in a university, in a private high technology corporation, or in a government-supported research institute, and he can achieve as much personal and professional satisfaction and prestige with MIT, as with IBM, as with NIH, for example. In other words, the intimate interaction between science, technology and society in the United States, as well as our economic and institutional framework, open up innumerable choices for a professional career in research and development, in either the private or the public sector.

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[1] Hongqi (Red Flag), No. 2, Jan. 16, 1980, translated in JPRS (Joint Publications Research Service), No. 75,317, Mar. 17, 1980. The fact that he was specifically referring to the exclusion of younger scientists from positions of authority, does not detract from the general significance of the statement.

[2] Hendrick W. Bode, "Reflections on the Relations Between Science and Technology," Basic Research and National Goals. A National Academy of Sciences report to the Committee on Science and Astronautics, U.S. House of Representatives, March 1965, p. 76.

For the science graduate from a Chinese university, however, there is basically only one very narrow path to the top—the top being a research institute of the Chinese Academy of Sciences (CAS), the Chinese Academy of Medical Sciences, the Chinese Academy of Agricultural Sciences, or one of the more prestigious key universities. At worst, the Chinese science graduate must be able to get into a research institute under the jurisdiction of one of the appropriate production ministries. The Chinese science graduate knows only too well the vast professional, social and economic differences between a career in the CAS as opposed to a career in any other sector of the economy. And he knows too that because of restricted mobility, a factory laboratory is not a stepping-stone to an institute of an academy. Prestige and influence come not simply from such tangibles as higher salaries and better housing, but also from a host of intangibles that make a CAS position extremely valuable and desirable. If the young Chinese scientist makes it to the CAS, he is likely to follow the precedent of those who are already there, that is, maintain as big a distance as possible between research in the institute and the practical problems of the economy.

This description of an elitist tendency in Chinese science is admittedly over-generalized. As in everything else, there are individual differences and there are differences between specific fields of science. The scientific elitism that does exist, however, cannot be treated lightly because of its potential potency within the state and party hierarchy. In the United States, despite the existence of the Office of Science and Technology Policy, under the Science and Technology Advisor to the President, the influence of scientists is filtered through a variety of governmental and professional institutions. In China, scientists are not sought out only for advice and suggestions about innumerable decisions relating to the modernization process; some actually occupy key positions in government, while many more can exert significant influence through highly developed informal relationships with officials in policy-making positions.

This paper will review China's current efforts at economic readjustment in terms of their impact on policies and programs in science and technology and speculate about the likely resistance the leadership is facing from China's very loosely knit "science lobby."

THE BRIEF SPELL OF OPTIMISM

Considering the lowly position to which Chinese science and technology had dropped by 1976, no one can deny the tremendous progress that has been made since the fall of the "gang of four." After a decade of abuse, it was not easy to undo the damage that had been done, to rebuild the scientific establishment, and to convince the nation that, far from being "parasites," China's scientists represent a productive force indispensable to the goals set out by the "four modernizations."

The first solid stepping-stone of the transition period was reached in March of 1978 when China held its major National Science Conference. Some 6,000 delegates sat for almost two weeks in Beijing's Great Hall of the People to hear leaders in both the government and the sciences discuss past mistakes and outline new directions for China's science and technology.[3] Although some of the speeches implied there was still an absence of consensus, the speakers left no doubt as to the priority the new leadership assigned to science and technology. Released from the political shackles which so severely constrained scientific development, the changes were comprehensive and the goals set forth at the Conference were understandably ambitious—sometimes even unrealistic.

In his report to the Conference, Fang Yi—who was then the Vice Premier of the State Council and Minister in Charge of the State Scientific and Technological Commission—admitted that China lagged 15 to 20 years behind advanced world levels in many branches of science and technology; nevertheless, he was optimistic about the future. It was his hope that by 1985 China would build new research facilities, expand research, rapidly increase the number of professional research workers, and in the process "approach or reach the advanced world levels of the 1970s in a number of important branches of science and technology." This, in turn, would make it possible for China to "catch up or surpass advanced world levels in all branches" by the year 2000. Such general designs should never be taken literally, but they serve a national need for direction.

More indicative were some of the specifics spelled out by Fang Yi in presenting the outline of the 8-year plan for science. It was as if the cork had been popped from a long-stoppered bottle, and all the pent-up energy and ideas had escaped into the plans and projects for China's modernization of science and technology. The plan identified research needs in 27 "spheres," including oceanography, environmental protection, medicine, transportation, finance, education, etc., but gave special prominence to the following eight fields: agriculture, energy, material science, computer science, lasers, space science, high-energy physics, and genetic engineering. In these priority fields Fang Yi identified 108 key projects for special attention. It was a grandiose bill of fare, which clearly reflected not only national priorities, but also special interests of individual scientists or groups of scientists.

The euphoria about the future did not dim the realization that first some very important political and administrative changes had to be made to strengthen the scientific establishment. As part of this process, the powerful State Scientific and Technological Commission was reestablished under the State Council, to coordinate China's national scientific activities. The Chinese Academy of Sciences, which lost most of its administrative authority during the Cultural Revolution, was also gradually restored to its place of eminence and influence, resuming its responsibility for planning, directing and supporting research. It also assumed the critical role of selecting and training China's most outstanding students for graduate studies in one of its research institutes, of which there are now 117. Scientific associations began to flourish once again. Most important, politics, which dominated science as it did everything else when the "gang" was in command, had to be exercised from the system and control of research had to be returned to the scientists. There are still complaints that some directors of research have little real power because party leaders believe that they "should have the final say in everything," but in general, "expertness" has definitely taken over from "redness." Professionals are judged solely on their performance, ranks and titles have been reinstated, and prizes and other incentives have been reintroduced. Contacts with foreign scientists and institutions were reestablished and nurtured into useful collaborative arrangements. Despite some lingering opposition to such drastic and rapidly implemented changes, in the first months of 1979 there was no doubt that science and scientists were back on top.

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[3] The complete texts of the major speeches at the National Science Conference are contained in appendix A. of Leo A. Orleans, ed., "Science in Contemporary China," (Stanford University Press, 1980.)

China's economy was also experiencing a brief period of euphoria in 1978—a condition that was reflected in the ambitious goals and plans for the "four modernizations" laid out by Hua Guofeng to the National People's Congress that year. The difficulties that ensued are discussed in detail in the various chapters of this volume. As Dernberger points out, ". . . as a result of the economic policies and reforms adopted by the post-Mao leadership . . . budget deficits, inflation, import surpluses, declining growth rates, large pockets of poverty in rural areas, and urban unemployment had become problems of serious concern," [4] and recently established targets had to be drastically scaled down. Chinese optimism in 1978, encouraged by well-wishing foreign advisers and trade-wishing foreign businessmen, resulted in extravagant industrial schemes which soon had to be suspended, and equally ambitious and varied imports of foreign technology which China was not yet able to digest. "To ensure that foreign twigs can take root, bud, blossom and bear fruit in China," said a commentator in the *People's Daily*, "we must prepare excellent soil and create the necessary conditions of all kinds." [5]

In this fundamental reassessment of economic objectives and realignment of development strategy, science could not be excluded and it too was charged to "retreat in the course of readjustment." Consequently, China's scientists are once again finding themselves on a downward incline and, gentle though it may be, many of them must be thinking: deja vu. Just what are the current complaints about science and technology and what are the changes policymakers are pressuring the scientists to undertake?

CRITICISM AND REASSESSMENT

In China, major policy changes are seldom announced abruptly. There is usually a period when support for existing policies and the expression of new ideas and criticisms appear simultaneously in statements of various publications and officials. Gradually, the direction of the proposed policy changes becomes clearer until finally all doubt disappears about what Beijing's actual intentions are. By then, the individuals most affected are adequately tempered and acceptance should be more gracious. This was the process that was evident in 1980 with regard to science. There was still much talk about "big science" (often used as a euphemism for basic research), research activities were still proliferating, and leaders of the Chinese Academy of Sciences continued to stress that "there should be no taboos in science." At the same time there was a rapid acceleration in articles discussing the need for scientists to become more involved in the nation's practical problems, to be more conscious of economic constraints on research, and to give priority to improving productivity, especially in agriculture and light industries. Introductory caveats about scientific freedom have become sparser and the direction that science is supposed to take is presented in no uncertain terms.

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[4] Robert F. Dernberger, "The Chinese Search for the Path of Sustained Growth in the 1980s: An Assessment," in this volume.

[5] Renmin Ribao (People's Daily), Mar. 27, 1981, in FBIS, Apr. 14, 1981.

There is no shortage of articles and speeches in the Chinese press critiquing the scientific activities of the past few years. What follows, however, is taken from an article by two authors in a June 1981 Shanghai newspaper. It summarizes all the important issues that have been bandied about and implies an accurate representation of the position now held by the Party Central Committee and the State Council.[6]

As prescribed, the first few paragraphs of the article provide the appropriate political setting, which sometimes can be quite confusing. Depending on the particular moment in China's political cycles, all errors—even the same ones—are blamed either on "leftists" or on "rightists." For example, during the Cultural Revolution and the years that followed, the inclination of scientists to engage in basic research was then attributed to their "rightist" tendencies; now, the very same inclinations are termed "leftist" errors. Another quick shift is occurring in the use of the term "productive force." Only a few years ago, the people of China were repeatedly told that, contrary to the notion held by the "leftists" (the "gang"), scientists are an integral part of the country's "productive forces," i.e., just like workers and peasants. Now, however, we learn that "to simply say that science and technology are productive forces is not sufficient" and represents a "leftist" error again; for scientists to be part of the "productive forces" their activities must be integrated with economic development "in both topics and systems of research." The main obstacle to implementing this change—the "correct policy of the Central Committee and the State Council"—is the "two strips of skin" that now exist between science and technology and the economy.

In this article, as in all others dealing with these issues, the brunt of the attack is reserved for "big science," which is limited essentially to work that is performed at the Chinese Academy of Sciences. Presumably, most of the leadership does not subscribe to the view held by some, that basic research is equivalent to "throwing money into the pond without even producing bubbles," but there is nevertheless a strong feeling that it does "devour" limited scientific and technical personnel which should be participating in applied research. The main goal of the higher scientific community is to "blindly catch up and overtake world science," without paying any attention to the national conditions. Proponents of "big science" believe that China must have things that foreign countries have as well as things which they do not have—a notion that is completely unrealistic given China's economic abilities. The authors point out that there are too many fields in science for any one country to be the leader in all of them. To make matters worse, the primary concern of scientific research has been the production of academic reports without any concern for scientific research or economic effects. Scientists are impatient for success and use little judgment in selecting subjects for research—blindly launching research which sometimes must be suspended because of shortages of manpower, financing, and materials.

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[6] Jiefang Ribao (Liberation Daily), June 2, 1981, in FBIS, June 11, 1981.

The article maintains that there is a similar lack of orderly planning by scientists working in applied research. Products are developed without anyone bothering to conduct market surveys and without any effort to popularize the results of the research. Consequently, for long periods many products are found only as "samples, exhibits, and gifts" and are rarely even actually produced. On the average, only about ten percent of China's research can be promptly applied to production, as opposed to 80 to 85 percent in the United States. At all levels of research there is serious duplication and waste. According to some estimates, about 40 percent of the research subjects undertaken in China duplicate foreign research which has already produced results; the degree of duplication within the country is even higher. One of the examples given is that "no less than 980 units in China are developing haploid seed breeding." Another is that, despite a shortage of manpower and money, 28 of 63 projects introduced in 1978 and 1979 in Shanghai's scientific and higher educational institutions were duplicating each other and 24 of them duplicated projects which were introduced in 1973 and 1974.

The proliferation of research at the national level is mirrored at the local levels. The authors suggest that the 1978 National Science Congress did too good a job of promoting science and technology, causing the phenomenon of "all levels building research center and flowers of science blooming everywhere." The striking example of this proliferation is the fact that China's 2,000 farm machinery research centers employ only 20,000 researchers. This situation is delightfully described by the authors: "Some research centers are dubbed 'three no' centers (no research subject, no funds, and no personnel), some are known as 'three diminutive' centers (one room, one seal, one empty shelf), while others are styled 'three machine' centers (one mimeograph, one stapler, and one telephone)."

The article ends by emphasizing once again that "the gravest consequences" stem from the fact that so much of scientific research has been incompatible with national economic development. Concern with "world science" is simply out of step with the level of China's development and the needs of her economy. Science cannot develop without a strong economy any more than the economy can grow without an important input from science; it is therefore vital that economic and scientific planning be synchronized.

ATTITUDES OF SCIENTISTS

Now let us consider these serious accusations, which tend to cut across the whole spectrum of China's scientific establishment, in the context of the postulation that scientists at the Chinese Academy of Sciences have strong elitist tendencies. Just how receptive will these scientists be to any suggestion that they cut back on some of their more esoteric research and become more intimately involved with the more mundane problems encountered in the development of China's economy?

There is little doubt that many scientists will be resistant to the new scientific direction, but the resistance will be uneven, depending on the various research sectors. The implementation of the current policy should be easier within the several thousand research institutes falling under the production ministries, because most of these institutes already have direct links with factories and other enterprises under the jurisdiction of a particular ministry. Similarly, although there may be institutional differences, changes should not be terribly traumatic for the scientists at the Academy of Agricultural Sciences or the Academy of Medical Science, because it is in the nature of their sciences to be more cognizant of the practical problems encountered in the field. The most severe test for Beijing will be to turn around the much more elitist and isolated scientists at the Chinese Academy of Science.

It must be remembered that the policies and research projects in science and technology, which are now criticized, were not drafted by the State Council or the People's Congress. They were drawn up in 1977 and 1978 by some of China's foremost scientists—a large proportion of them foreign-trained. And, it should be remembered that in those years China was expecting oil to supply the revenue for all of the country's necessities and extravagances. Who could possibly question the scientists' recommendations and priorities, especially at a time when the nation was still making amends to them for the Cultural Revolution. Looking at the 8-year plan for development of science and technology, one could easily gain the impression that each long-frustrated scientist managed to slip in his own pet project in his own special field of interest. Furthermore, they were supported in many segments of the scientific plan by foreign scientists (most notably Americans of Chinese descent), who frequently visited the country and whose advice was intensely sought. Foreign scientists, preoccupied as they are with their science, could not be expected to concern themselves with China's economic realities. They brought with them the values of advanced foreign science: scientists must be free to pursue their interests and, if China is to modernize science, there must be basic research.

Even as China was announcing its projects at the National Science Conference in 1978, there were those outside the country (including some scientists) who were questioning both the value of many segments of the program and China's capabilities to achieve them. Is China's space research, for example, a reflection more of chauvinism than of need? Does China really need a high energy accelerator, or does such a priority reflect the disproportionately large number of influential high energy physicists in China? Should China be concerned about making "discoveries and creations in new types of laser devices"? Should China spend resources on "basic studies in genetic engineering"? How quickly can Chinese scientists, isolated from Western science for so many years, catch up with existing knowledge to upgrade their own competence and to avoid duplicative research? Can a younger generation of top scientists be trained in time to assure continuity in the years to come? Scientists make a strong case that fundamental understanding is a prerequisite to technological development and that many practical benefits come from research projects which, initially, had only intrinsic intellectual value; that without basic research it is impossible to attack practical problems creatively. But while in the United States scientists face the constant challenge of convincing the Federal Government (which provides about two-thirds of the R&D budget) of this fact, Chinese scientists were much more successful in overcoming whatever resistance their own leadership may have offered. Economists and other specialists experienced in the problems of Third World nations (and to what world China belongs is a moot point) would tend to agree with the more modest goals currently encouraged in China. Most would say that a nation with limited resources would be better off borrowing the existing scientific and technical knowledge from the highly developed nations and adapting it to their own needs. They would be sympathetic with Beijing's present sentiment that in science, "We should not try to do everything from scratch nor attempt to invent everything ourselves."[7]

The retreat which is being imposed on the scientists of the Academy of Sciences will undoubtedly encounter pockets of resistance. It will be difficult to abandon some of the on-going research and the scientists still have enough clout to argue that their particular project does, in fact, have potential economic value. For example, one scientist reporting on the work of the physics and mathematics departments to the Academy's Scientific Council, insisted that "the policy of neglecting basic research work is a shortsighted one." He yielded that "it is unrealistic to carry out basic research work in all fields on a large scale," but then went on to argue that "major support" be given to research which is apparently of special interest to him.[8]

Even more important is the possible effect of the retrenchment on China's international relations in science. Only in the past few years have Chinese scientists begun to participate in international conferences and, in a variety of ways, to reestablish and create new contracts with scientific colleagues around the world. The CAS has already sent hundreds of middle and upper level scientists to the United States for additional training and upon return they quickly gain very special status. Hundreds of Chinese scientists must be involved just in the scientific protocols and agreements included in the general agreement signed in 1979 by the United States and China to cooperate in science and technology.[9] Will scientists involved in these and similar bilateral exchange programs be allowed to pursue their work without interference? Whatever the answer, it is likely to affect relationships either with the international scientific community, or with their own colleagues who have had to re-orient their research.

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[7] Beijing Domestic Service, Jan. 10, 1981, in FBIS, Jan. 13, 1981.

[8] Xinhua, Mar 15, 1981, in FBIS, Mar 20, 1981.

[9] For an excellent review and evaluation of the U.S.–P.R.C. science protocols, see Richard P. Suttmeier, "U.S.–P.R.C. Scientific Cooperation: An Assessment of the First Two Years," paper prepared for the Department of State (contract No. 1751–000372), June 1981.

Policy-makers may insist, as they do, that "it is necessary to integrate scientific research with production," but quite frankly, it is very difficult to picture scientists from the Academy getting intimately involved in discussions about various technical and economic advantages and disadvantages with managers and technical personnel of production enterprises. And although some spokesmen can insist that "scientists and intellectuals in our country were never before so warmly welcomed by the peasants," the idea of academicians volunteering to spend any significant amount of time in the countryside stretches one's imagination.

For that matter, it is only fair to point out that the problem of inducing scientists to contribute to production problems is not entirely one-sided. There are many complaints about the reluctance of plant managers and brigade leaders to receive advice from "intellectuals," no matter what their actual competence. Because of this "remnant poison," opinions of specialists are frequently resented and ignored.[10] An explanation of this attitude may well be reflected in the following complaint: "At present our comrades who are engaged in scientific and technical work do not understand economic conditions very well and will find it difficult to consider in-depth economic benefits, shortcomings, gains and losses." [11] In other words, the new Chairman of the Communist Party, Hu Yaobang—who is not known, incidentally, for his benevolence toward the scientists—may urge them to "thoroughly examine production practices to find needs to meet," [12] but persons charged with running profitable enterprises tend to resent such interferences by persons inexperienced in problems of production.

One final point. Just a glance at the list of almost 120 research institutes under the CAS would support the contention that there has been a great propensity on the part of the scientific community to create narrowly-focused institutes to solve specific problems. The initial reaction might be that such a system would indeed assure problem-oriented research by scientists. In fact, while this benefits just a few fields, it benefits all the concerned scientists. Not only does an independent institute automatically provide budget and resource allocations for specialized research, but it creates a new administrative hierarchy with direct access to the leadership in the CAS. At the same time, such institutional specialization accentuates the already acute and recognized lack of interaction between scientists, which adversely affects their effectiveness. There is a new movement, however, that could alleviate some of these problems. If successful, current efforts to incorporate some serious research into the university system could have some far-reaching implications not only in increasing communication between scientists in different disciplines, but also in the general decentralization of knowledge—which should facilitate greater interaction between science and the economy.

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[10] See, for example, Jingji Yanjiu (Economic Research), No. 1, February 1981, in FBIS, Mar. 17, 1981.

[11] Jingji Yanjiu, No. 11, Nov. 20, 1981, in JPRS, No. 77,285, Jan. 30, 1981.

[12] Xinhua, May 21, 1981; in FBIS, May 22, 1981.

WHO CONTROLS SCIENCE?

In conclusion, it is necessary to face a seeming contradiction that exists between this speculative discussion about some of the adversities facing Chinese scientists and the most recent science conference, which has prompted many—with some justification—to observe that the position of scientists has actually improved.

In mid-May 1981, the 400 members of the Scientific Council of the Chinese Academy of Sciences convened for 10 days in Beijing—the first such session in 21 years.[13] Probably the most important science meeting since the 1978 National Science Conference, it was addressed by China's top political leaders and many of China's prominent scientists. A few of its accomplishments are of particular significance in the context of this discussion. Fang Yi, who was appointed as President of the Chinese Academy of Sciences in 1979 and guided it through the transition, resigned his position and Lu Jiaxi, a distinguished physical chemist, was elected by the Presidium of the Scientific Council to take his place. At the same time, the new Constitution provides that the Scientific Council will be the ' supreme decisionmaking organ of the Chinese Academy of Sciences." Consequently, at least on the face of it, the conclusion expressed by the new President of the Academy on the eve of the 60th anniversary of the founding of the CCP, seems perfectly understandable. He said that the party's decision to put scientists instead of Party administrators in charge of science shows the trust the Party places in scientists—that "now the role of Chinese scientists is more fully appreciated." [14] While the full meaning of all the changes and proposals made at the Science Council meeting remains unclear, there are indications that some of the gains may be illusionary.

First of all, the 400-member Scientific Council is, of course, too large to be a "supreme decisionmaking organ," and the Academy is actually governed by the much smaller Presidium. It is significant that one-third of the membership of this commanding body comes not from the Scientific Council, but is composed of "leading members of the departments concerned under the State Council and leading members of the Chinese Communist Party organization in the academy." [15] Not exactly a vote of confidence for the scientists. The leadership role of the Party was stressed by Zhou Peiyuan, the Vice President of the CAS, at the July meeting of the 6th Plenary session of the Chinese Communist Party. He said that historical evidence has proven that science alone cannot save China, that without the Communist Party there can be no China, and that all scientists must follow the Party.[16]

Even more important in terms of control over the Academy is the position of Lu Jiaxi, its new President. It cannot be coincidence that both he and Fang Yi come from Fujian Province, and it is safe to presume that Lu was not "elected through a democratic process," as claimed, but was handpicked for the job. In China this represents an extremely important relationship which insures that as head of the Science and Technology Commission—which is, in fact, the supreme policymaking body in science—Fang Yi will continue to be the behind-the-scene interpreter of the Academy's mission and activities.

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[13] For a detailed account of this meeting, see Howard S. Klein, "Scientists Lead CAS Following Scientific Council Meeting," China Exchange News, Sept. 1981.

[14] China Daily, June 28, 1981.

[15] Beijing Review, No. 22, June 1, 1981.

[16] Kuangming Ribao, July 14, 1981.

Also, in the ten days of speechmaking, there was a key sentence buried in the report by Fang Yi, lamenting the "over-concentration of power in the Academy."[17] Such a statement is not made casually and despite the lavish praise he heaped on the scientists, it is safe to assume that the Academy lost something in the course of the reorganization. It would appear that by stressing the Academy's long-range tasks, primarily "in pure science and other fields of technical science," and contrasting these with the immediate and short-term scientific research in industrial departments and local scientific research institutions, Fang Yi seemed to circumscribe the Academy's control functions over scientific activities outside its own institutes.

Given the extreme policy fluctuations, we're inclined to forget that most Chinese are realistic most of the time. Scientists may be elitist and they may have (to their own detriment) oversold their case in 1977 and 1978; at the same time it is only fair to assume that in most instances their motives were well-intentioned and they sincerely believed that strong and internationally competitive science was synonymous with a strong China. While China's national defense dictates that emphasis in science be redirected toward the economy, China also is chauvinistic—she has many world-level scientists and will not deny them the opportunity to do basic research in those areas of science where there is real promise of achievement. The leaders may even adjust to the inevitability of elitism among the scientists. After all, what an individual is, is not determined either by "class nature," as the Communists would have us believe, or by "human nature," as we are apt to assume, but by a combination of both. Although they may not admit it, the policymakers must know that conversion of an elitist scientist to a proletarian scientist runs counter to both "natures." The Chinese say that "You don't cut off the feet to make the shoes fit." At this stage, Beijing is only binding the scientists' feet to force them into the tight shoes of economic readjustment.

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[17] Kuangming Ribao, May 27, 1981.

RESEARCH, INNOVATION, AND THE CHINESE POLITICAL ECONOMY

By Richard P. Suttmeier[*]

INTRODUCTION

For over 100 years Chinese political elites have sought to encourage the development of modern science and technology in China. Science and technology have been viewed as essential means to achieve both economic modernization and national security. Elite commitment to scientific and technological development was strengthened after the Communist regime came to power in 1949. The post-Mao drive for scientific and technological development, and the identification of science and technology (S&T) as key factors in the modernization of agriculture, industry and national defense, is thus but the latest reaffirmation of an elite recognition that reliable knowledge of the material world is essential for the transformation of China into a prosperous and powerful country.

In spite of this historic commitment to S&T development, it has been difficult for political elites to maintain policy and programmatic continuity to match the commitment. In the post-1949 era in particular, science and technology policies and programs have been subject to radical shifts in emphases and approaches. The most notable deviation from international norms of S&T development occurred during the Cultural Revolution years, but even post-Mao policies have been characterized by discontinuities.

It is also notable that while the historic commitment to S&T development has been justified in terms of contributions to economic prosperity and military security, finding appropriate mechanisms for coupling research to economic and military needs has been elusive. Indeed, one of the reasons for the frequent science policy adjustments over the past 30 years has been elite dissatisfaction with the service to production provided by the research system. The problem of applying S&T to production is one important facet of a larger problem of technological innovation, a capacity for which is at the heart of what it means to be "modern." Preoccupation with S&T development, due in part to misperceptions of the contributions of S&T to innovation, seemingly has diverted elite attention from the latter with the result that both S&T development and innovation have suffered.

The search for explanations of both the "policy discontinuity" and the "neglect of innovation" phenomena ultimately involves questions of organization—economic organization and organization for expressing political interests leading to policy making. Since economic orga-

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nization in China is inherently political, given the socialist nature of the economy, and since much of Chinese politics and policy making is embedded in economic management at both the micro and macro levels, science policy and innovation issues are usefully approached from a point of view sensitive to both political and economic factors.

The most characteristic feature of the Chinese political economy in both traditional and post-1949 China is the economic role of government bureaucracy. "Bureaucratism" as an undesirable but somewhat inevitable behavioral manifestation of the dominant structure, has been a crucial factor affecting both S&T development and problems of innovation. One manifestation of bureaucratism is a commitment to the maintenance of bureaucratic dominance as the primary value of political elites. As a result in both the 19th century and in the post-1949 period responses to modern science and technology have been characterized by: (1) the dominance of political criteria in national economic decision making, or "politics in command"; (2) a limited tolerance for the development of an autonomous economic system; and (3) extreme sensitivity to the social and political implications of technological change.[1]

In spite of the facts that the fostering of science and innovation have been historically problematical, and that China's bureaucratic heritage seemingly is at odds with Western views of desirable institutional arrangements for research and innovation, Chinese S&T have clearly progressed since the founding of the People's Republic, and the economy is not without signs of considerable technical progressiveness.[2] China has produced some stunning scientific and technological achievements, and has been able to develop entirely new industries largely on the basis of its own efforts.

However, there is great unevenness and disjointedness in Chinese scientific, technological and economic development, and therein lies the difficulty of assessing China's technological and economic future. The achievement of China's modernization goals will require an enhanced capacity for technological innovation. Economic structure and research and development potentials are often the foci for examination of innovative capacity. However, in light of China's recent history, attention to the economics of innovation in China without regard to politics would be a mistake.

All political economies are mixes of three types of institutions for social coordination and control.[3] The two most commonly thought of institutional types are markets and administrative structures. A third type which often figures prominently in Marxist and non-Marxist utopian thought, but which exists in all systems, includes those institutions which achieve coordination and control by promoting a high degree of normative consensus among the members of society.

Without denying their important economic functions in traditional China, and to some extent in the Communist era, markets in China have played a distinctly residual role in national coordination and control in comparison with the other two. The decisions of the Chinese authorities in the early 1950's reflected a clear preference for the creation of administration structures to be extended to all aspects of Chinese society, and most importantly for our purposes, to the economy and to scientific research in particular. Thus both economic and scientific institutions, following the Soviet paradigm, were designed to be complex, hierarchical structures characterized by chains of command and divisions of labor, and assumed to be responsive to rationally devised plans.

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[1] Shannon R. Brown, " 'Western Learning for Use' : The Reception of Foreign Technology in Confucian and Communist China," in Tsai Wei-ping (ed.), "Struggling for Change in Mainland China : Challenges and Implications," Taipei, Institute for International Relations, 1980, pp. 121–132. c.f. Richard Baum, "Scientism and Bureaucratism in Chinese Thought : Cultural Limits of the 'Four Modernizations'," unpublished paper presented to the annual meeting of the Association of Asian Studies, Toronto, Mar. 13–15, 1981.

[2] See Thomas G. Rawski, "China's Transition to Industrialism," Ann Arbor, Center for Chinese Studies of the University of Michigan, 1980.

[3] This formulation draws inspiration from Charles A. Lindblom, "Politics and Markets," New York, Basic Books, 1977.

There were many aspects of this first try at institution building that proved to be unworkable in China, and thus by the late 1950's institutional reforms were being implemented. These reforms included administrative decentralization and stepped up efforts to achieve normative consensus through various types of political campaigns designed to achieve ideological rectitude. It is important to recognize that correct ideology was considered important not only in a narrow political sense, but also because it would contribute to the "right" economic and scientific decisions. Thus, scientists who had been accused of orienting their work to the criteria of international science (thereby embracing "bourgeois" ideology) could be expected to serve society better if they shared a normative consensus with workers and peasants from whom they were expected to learn.

In the early 1960's, the stress on normative consensus declined and the role of markets increased somewhat, although administrative structure, in a modified decentralized form, remained the dominant mode of coordination and control. However, by the middle of the 1960's one of the modern world's most extensive and sustained efforts to abolish administrative structure and establish normative order was begun. The outcome of this "cultural revolution" not only provided a lesson to China and the world that some structure is necessary for civil society, but also bequeathed to the China of the 1970's very serious institutional problems.

The Cultural Revolution was "successful" in severely disrupting China's administrative order, so much so that it has proven to be quite difficult to reestablish. However, the excesses of the Cultural Revolution years also seriously eroded popular commitment to the ideological norms around which a new social order was to be organized. Thus as China entered the post-Mao era, of the three mechanisms for social coordination and control noted above, one had been largely discredited (the normative order) and a second (administrative order) was in disrepair. Not surprisingly therefore attention shifted to the possibilities of devising a new order in which markets would play more of a central role than at any time since the founding of the People's Republic. The introduction of markets has not gone smoothly, however, for both economic and political reasons.

One of the sad ironies of the Cultural Revolution legacy is that instead of giving birth to a new normative order, it has encouraged forms of traditional social behavior which are seemingly inimical to modernization. The Cultural Revolution of 1966–69 lest as a legacy for the 1970's a highly unpredictable and hostile social environment in which individuals were unprotected from seemingly arbitrary exercises of power and coercion. One would expect that individuals interested in self preservation would respond to such unpredictability by seeking informal alliances and personal relations with others holding authority. This is exactly what seems to have happened in China during the last decade as various forms of particularistic behavior which had long been problematic for Chinese modernization again became highly characteristic of Chinese politics. This particularism manifests itself in widespread factionalism and patron-clientism, in a reliance on dissembling and guanxi ("connections") to get things done, and in such forms of bureaucratism as "turf" protecting resistance to policy implementation and serious risk aversion.[4]

Chinese political life is thus characterized by an unfortunate conundrum. Elites struggle over what should be the proper mix of market, administrative and normative elements in a new constitutional order which is needed to arrest the drift toward greater particularism. However, the latter makes it difficult for any new constitutional order to get established, particularly one incorporating reforms supportive of modernization goals. This dilemma has tended to bias the political elite towards choosing the familiar somewhat authoritarian, administrative "constitutional settlement", as the recent retreats from economic and political liberalization indicate.[5]

Viewed from historical perspective the choice of the perennial "Chinese solution" of tighter bureaucratic discipline and control seemingly reveals a soft determinism at work. However, Chinese elites also remain committed to modernization goals and recognize that excessive administrative structure in an increasingly complex economy is counterproductive. Developments in S&T and in the economy, including the maintenance of active international relations in these realms, have consequences for the political economy and for the emergence of a new constitutional order, just as the political economy shapes the development of the former. An understanding of this complex and dynamic interrelationship is an important part of the answer to the question of whether China will break out of its historically problematic encounter with S&T development and the problems of innovation. A first step is to inventory the "assets and liabilities" China brings to the task.

THE RESEARCH SYSTEM—AN OVERVIEW

China enters the 1980's with a national system for research and development that in some respects is more characteristic of an industrialized than a developing country. From a low level in 1949, the development of its extensive research system during the last 30 years is an impressive accomplishment. The Chinese Academy of Sciences (CAS), for instance, which had less than 20 institutes at the time of its founding in 1950, has grown into an enormous establishment composed of 113 research institutes, covering most fields of natural and engineering sciences.[6] Included are 5 institutions in mathematics and mechanics, 12 in physics, 15 in chemistry, 5 in astronomy, 21 in earth sciences, 26 in biology, 25 in technical sciences, 3 in agricultural modernization, and 1 in history of science. In addition the Academy runs libraries, publishing houses, eight factories, and has a hand in running universities. CAS employs 80,000 people, 36,000 of which are research personnel (CAS).[7]

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[4] On the influence of bureaucratism on science policy implementation, see Richard P. Suttmeier, "Politics, Modernization, and Science in China," in Problems of Communism (January–February, 1981), pp. 22–36.

[5] For a stimulating analysis of this point as it relates to recent economic reforms, see David M. Bachman, "Local Interests and Changing Economic Policy in Post-Mao China," unpublished paper, Stanford University, Department of Political Science, May 1981.

A sense of the difficult institutional choices the Chinese face is captured in the words of the president of the Chinese Academy of Social Sciences: "Once centralized, rigidity sets in; once decentralized, chaos ensues.". Hu Qioumu, "Observe Economic Laws, Speed Up the Four Modernizations," Beijing Review (Nov. 17, 1978), p. 20. Cited in Ibid.

Research and development in production ministries has also shown impressive quantitative growth. The number of institutes in this sector can be estimated to be slightly more than 2,000 in 1980.[8] In agriculture, the central Academy of Agricultural Sciences in 1981 had 34 institutes under its jurisdiction, and in addition, most provinces had their own agricultural academies. Slightly less than two dozen major agricultural colleges and universities served agricultural S&T as well.[9]

The status of research in universities and colleges has long been problematic. Since the 1950's Western trained scientists have urged that Chinese institutions of higher education (IHE's) become centers of research as well as teaching, but policy makers, reflecting the influence of the Soviet model, have tended to miss the significance of the teaching-research-advanced training relationship. Over time, research in universities and colleges became sanctioned, but until recently it has tended to be applied research in immediate service to production. While this orientation to practicality has seriously retarded the development of universities as centers of basic research, it has produced a system of close IHE-industry relations which does provide useful technical services to industry, and affords students and teachers opportunities to experience real production problems.[10]

In addition to the CAS, production ministry and IHE sectors, the research system is also composed of defense and "local government" sectors. The latter includes provincial, municipal, and county S&T committees and subordinate research institutes, as well as a network of rural experiment stations. Our knowledge of the defense sector is still limited, but it is known that over the years it has been the beneficiary of priority allocations of both manpower and finances.

In spite of impressive size and development over the years, the research system has a number of serious problems which limit its current and near future impact on innovative capacity. The first of these is the gap in the manpower pool caused by the interruption of education during the Cultural Revolution. A second is that in spite of official verbal commitments to S. & T. development during the last few years, financial commitments have lagged. Reportedly some 6 billion yuan have been budgeted for science and technology in 1981. This represents approximately 5 percent of an estimated total state budget of 120.46

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[6] The Chinese Academy of Sciences, 1980. Administrative Office of the Chinese Academy of Sciences, June 1980. In Chinese. (Hereafter, CAS.)

[7] Ibid.

[8] Beijing Review (Nov. 16, 1979), p. 3. This report noted the existence of 2,400 national research organizations.

[9] China Exchange News, Vol. 9, No. 1 (March 1981), p. 33.

[10] William A. Fisher, "Do We Stand on Our Heads While We Work?", unpublished
The most detailed recent discussion of the university research system is Thomas Fingar
Asia-United States Forum on International Policy, November 1980.
(ed.), "Higher Education in the People's Republic of China, Report of the Stanford University Delegation, May 22–June 11, 1980." Palo Alto. Stanford University Northeast paper, School of Business Administration, University of North Carolina (u.d.), p. 13.

billion yuan [11] and considerably less than 1 percent of GNP. Of this 6 billion yuan, some 600 million is allocated to the CAS.[12]

China's pool of scientific manpower has grown considerably over the years, and now reportedly includes some 6 million "science and technology workers",[13] a category which includes both graduates of IHE's and of secondary technical schools.[14] Of these, approximately 310,000 are in R. & D.[15]

However, there is great qualitative variation within this manpower pool as a result of shifting educational policies in the past. It is unlikely that the educational system can produce the numbers of individuals with high level training that the leadership has said it needs (800,000 in R. & D. by 1985) and it is certain that it cannot meet present and short term future demand for higher education.[16]

In this context, programs to upgrade lower-level manpower take on special importance. China has had considerable experience with lower and middle level manpower training, dating back well before the Cultural Revolution. The CR spurred an expansion of this type of training, and the CR-inspired "May 7" and "July 21 universities" were enrolling some 780,000 people in 1976.[17]

Contemporary assessment of these institutions are not flattering. The "May 7" and "July 21 universities" have been radically reformed, and the CR approach to lower and middle level manpower training have been criticized both in terms of quality and in terms of the numbers of individuals served. While the number of people receiving spare time education in mid-1980 reached almost 30 million, reportedly, the educational level of most workers is still below middle school level. The failure to raise this level (now blamed on the educational policies of the 1966–1976 period) is regarded as a major cause of current low labor productivity, according to some reports.[18]

In the face of severe constraints on the expansion of conventional education, particularly higher education, the regime cannot be as critical of the low level of formal education of the population as it might be, and fortuitously, the innovative potential of the common worker is not being overlooked. Thus, there continues to be a recognition of the innovative contributions of the unschooled, or those with only basic education. Beijing Normal University, for instance, in a survey of 400 technical personnel who had made significant contributions to production found that 49 percent of them had not gone to college or university.[19] Self-education, television education and other forms of spare-time, informal training are being promoted with plans to add formal testing and degree granting procedures for the self-taught.[20] The Science and Technology Association (see below) has been enlisted to help establish training programs, and the Chinese have sought lower- and middle-level manpower training opportunities abroad as well, as part of commercial technology transactions.

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[11] Wang Bingqian, "Report on Financial Work," presented to the Fifth National People's Congress, Beijing Review 39 (Sept. 29, 1980), p. 18.

[12] CAS.

[13] Beijing Review (Mar. 31, 1980), p. 20.

[14] Interview with Mr. Wu Ping of the State Science and Technology Commission, March 1981.

[15] Ibid.

[16] For a more detailed discussion, see Leo A. Orleans, "Manpower for Science and Engineering in China," U.S. House of Representatives, Committee on Sciences and Technology, June 1980.

[17] Byung-joon Ahn, "China's Higher Education and Science in Flux," Contemporary China (March 1977), p. 22.

[18] Beijing Xinhua, Aug. 26, 1980. In Joint Publications Research Service (JPRS) 76410.

[19] Guangming Ribao (GMRB), June 20, 1980. In JPRS 7637.

[20] Wen Hui Bao (Shanghai), June 17, 1980. In JPRS 76272.

China's problems with the development of human resources through formal educational channels remains substantial. Educational and training institutions have been subject to severe disruption and mismanagement. China is poor in both financial resources and instructional manpower for educational expansion, yet, the demand for education is enormous. Almost half of China's 900 million plus population is under 20 years of age. Devising a human resources development strategy to cope with this demographic fact boggles the mind, and the implications for China's innovative capacity are incalculable. China's population, however, seems to be one that is motivated to upgrade its technical skills, and the existence of a variety of training programs, as well as the tradition of informal and spare-time educational opportunities, may mean that the problem of lower- and middle-level technical skill availability may be less outstanding than the high-level manpower problem.

A third problem faced by the research system pertains to decision making at both the macro and micro levels. In principal R&D is to be conducted according to plans, which are to be coordinated with economic plans. However, current discussions in Beijing indicate considerable dissatisfaction with the way this coordination has been conducted in the past.[21] The problem is a serious one since there is no ready way conceptually to attach economic value to R&D, and in China the difficulty is compounded by the inability of both the research and economic systems to generate the types of information which central planners need. Current reforms in the research system (discussed below) which emphasize contract research may be viewed as an attempt to improve decision making by radically decentralizing it to the level of enterprises and research institute.

However, such a solution leaves unresolved the abiding inability to determine an acceptable mix of basic research, applied research and development, and agreement on who the performers of each should be. Formally, the CAS is designated as the lead agency for basic research. Its share of the research budget accounts for approximately 10 percent of the total, a percentage which if truly for basic research would not be out of line with international standards. However, reportedly, only 5–10 percent of CAS' efforts go to basic research.[22] Although some basic research is beginning in the IHE's, it would appear that basic sciences are woefully neglected in a country that aspires to the further development of high technology industries.[23]

A related problem which has plagued the system since the 1950's, is its perceived failure to serve the economy as well as it might. Chinese political authorities have shown a certain philosophical ambivalence in attacking this problem in the past. On one hand they have regarded it as a problem of normative consensus attributable to the ideological mistakes of the scientists, who allegedly persued a "bourgeois" approach to science by ignoring the needs of socialist production in favor of research work oriented toward the reward system of the international scientific community. On the other hand, the problem has been attacked through adjustments in the administrative order. As a result, decentralization policies were adopted, particularly in the late 1950's and early 1970's, designed to make research facilities more responsive to grass roots production needs.

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[21] Wu Ping interveiw; Renmin Ribao (RMRB) editorial, Apr. 7, 1981. In "Foreign Broadcast Information Service (FBIS)," Apr. 21, 1981, K19ff.

[22] Beijing Review (June 1, 1981), p. 7.

[23] It has been the judgement of a number of Western scientific delegations to China that a weak basic research tradition inhibits the Chinese from reconceptualizing practical production problems into theoretical terms from which truly novel innovations could appear. Instead, excessive attention to practicality in research has resulted in a trial and error approach to production related R. & D.

These approaches to decentralization however continued to stress coordination and control of research through administrative means. The current stress on applied research and closer articulation between research and production is notable since it seemingly relies much more on a market approach as opposed to the administrative and normative approaches of the past.

While problems of manpower and funding can be viewed as problems of policy, those of decision making and economic relevance are more fundamentally problems of system design. The decision of the Chinese in the 1950's to emulate the Soviet model of organizing and managing R&D has produced a permanent institutional legacy for China. In spite of efforts to change the system—decentralization, ideological remolding and near dismantling during the Cultural Revolution—the main features of the Soviet model remain. These include the vertically organized sectors—CAS, ministerial, higher educational, defense—having separate bureaucratic hierarchies. Such a system requires central coordination, which is performed by the State Science and Technology Commission (SSTC) in China. As in the Soviet system, the relations between the central coordinating unit and the central academy are sometimes strained, and in both, the academies have been able to carve out a position largely independent of the former.

Experience indicates that such systems become highly bureaucratic and segmented. Communication and interaction become a difficulty, not only between research units and production units, but also between research units themselves. Interdisciplinary work leading to the development of new fields is difficult, although once the development of a new field is decided upon, typically new institutes are established which provide adequate resources for progress. However, there is little easy, flexible interaction short of the major decision to develop a new field.

Like the Soviet system, the Chinese have been institute oriented, with university research deemphasized. As a result, the advantages of relative institutional flexibility offered by the university as it relates to scientific communications within and between disciplines is lost, as are the advantages of linking research and teaching. Since production ministries have a strong hand in operating educational institutions for engineering, there is a tendency for these institutions to offer overly specialized training to serve the immediate needs of the production ministries and R. & D. institutes under them.

In spite of a number of problems with the Soviet model, it also has certain advantages. In principle it offers relatively stable and therefore predictable funding (although in China the research system was not able to withstand the major political disruptions of the last 15 years). The Soviet model also provides a convenient way to concentrate human and other kinds of resources to promote fields given high priority, and as noted above, to promote new fields. The neglect of university research is partially compensated for by advanced apprenticeship type training in academy institutes.

While China's R. & D. system is structured in terms of vertically organized sectors each with a bias toward centralization, decentralization measures have had an effect (see below). In addition, other S. & T. related institutions do crosscut the vertical sectors and help mitigate some of the negative effects of vertical organization. Of most interest here are China's professional societies and information systems.[24]

Chinese professional societies are of two main types. The first is organized by discipline. The second is organized by technology and is usually associated with a production ministry which relies heavily on that technology. Both types, however, draw membership from the vertical sectors. Both types are also under the general umbrella of the Science and Technology Association (STA).

When the STA was established in 1958 it was intended to be an organization that combined the activities of professional societies with responsibilities for popularizing science and promoting mass innovations. The STA quickly set out to establish a network of local branches, which in turn attempted to achieve the reconciliation of the "professional" and "mass" approaches to science by the establishment of local S. & T. exchange centers. The centers provided a common forum for scientists from the R. & D. sector and engineers, technicians and workers from industry. While the work of the STA was disrupted by the Cultural Revolution it now once again is quite active.

Professional societies sponsor the publication of journals, and the STA has an active popular science publication program. Thus the STA's efforts contribute to and are supported by an extensive national scientific information system. By 1980, this system included 72 S. & T. information research institutes, 3,000 national, regional and basic-level S. & T. information centers and more than 50,000 full time personnel.[25]

INDUSTRIAL R. & D. AND THE PROBLEMATIC WINDS OF REFORM

China's system of S. & T. institutions is currently undergoing considerable examination with an eye toward the initiation of reforms. During the last two years there have been indications of new creativity in the management and use of China's scientific resources. The STA has taken the lead in devising new approaches to the provision of technical services to industry and government. Its Shanghai branch, for instance, has been convening regular technical seminars to which industrial managers are invited, and, or both permanent and ad hoc bases, has organized experts to provide advice. Specialists from the Corrosion Prevention Society, for instance, have provided advice to the Machinery Import and Export Co. on anti-rust lubricants. The Packaging Research Society has conducted studies on bottle capping machines for a household chemical products plant. In addition, the STA and its member societies have served as consultants on matters relating to S. & T. personnel, and they have operated "technical clinics" providing "out-patient" and "referral" services.[26]

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[24] A useful recent discussion of professional societies is Robert O. Boorstin, "Professional Societies in the People's Republic of China," Washington, The National Council for U.S.-China Trade, 1979.

[25] Beijing, Xinhua, July 21, 1980. In FBIS, July 23, 1980.

Important reforms at CAS designed to give it greater autonomy from the state also have been instituted. A new CAS constitution has been adopted, which for the first [illegible], provides for the democratic election by scientific peers of th[illegible]emy's president.[27] Returning to practices from the mid-1950's, a scientific council of 400 leading scientists (which in turn elects a presidium to handle business when the council is not in session) has been designated as the highest policy making body, and the formal status of the Academy has been changed from that of an administrative unit of the state to that of a semi-autonomous academic lead organization.[28]

There are also signs of change in relations between research organizations and production units. For example, a report on the CAS Institute of Physics notes.

> For a long period, because of a lack of communications and because of obstacles inherent in our system, or our disregard of economic laws, it was impossible to apply and popularize scientific research results. Many research results became mere "exhibits," "samples," or "articles dedicated to a special occasion." Scientific personnel felt anxious and helpless as their research lay unused, not applied in production. Factories were kept in the dark about new technology developed by various institutes and had to manufacture the same old stuff year after year without the benefit of the new technology.[29]

The situation is changing, however. Factories are now actively seeking assistance from the Institute, and "scientific researchers are thrilled by this encouraging development, saying they no longer have to desperately peddle their research results." [30]

According to this report, the Institute has devised three approaches for dealing with industrial clients. First, it can sell the rights to a new technology to a factory outright, offering technical assistance until the new technology is put into production. A second approach is to provide technological guidance by sending experts to factories, or by training factory personnel at the Institute. Once the new technology is put into production, the Institute gets a certain share of the profits resulting from the innovation at an annually decreasing rate (e.g. 20 percent in the first year, 10 percent in the second). A final approach is to derive compensation for assistance in innovation by taking an annually decreasing percentage (e.g. 5 percent in the first year, 3 or 2 percent in the second) of the sales of a new product.[31]

The Physics Institute case seems to be a part of a wider experiment to allow research institutes greater autonomy as economic units, and more flexibility in aiding innovation through the use of market mechanisms. In Liaoning, this effort is referred to as expanding "the self determination rights of scientific research units," and it seemingly enjoys the full support of the provincial authorities. The concept of self-determination includes the rights to manage finances, employ personnel, map out research plans and receive materials. According to provincial vice-governor Zhang Zhiyuan, the first two are the most important. To give substance to the right to manage finances, Zhang supports the principle of allowing research institutes to increase their incomes and he believes it is wrong for institutes to transfer research achievements to production units without payments. Instead, institutes should have the right to earn income legally protected, and Zhang looks to patent protection as the primary mechanism.[32]

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[26] Xu Guoguan, "Good Staff Officers Needed for Four Modernizations," GMRB, Mar. 18, 1980. In JPRS 76024; see also Beijing, Xinhua, Sept. 17, 1980. In FBIS, Sept. 22, 1980.

[27] This procedure has now been followed with the election of the Academy's third president (and first scientist), physical chemist Lu Jiaxi (Ph.D. University of London).

[28] Beijing Review (June 1, 1981), p. 6.

[29] Beijing, Xinhua, Sept. 18, 1980. In FBIS, Sept. 19, 1980, L26.

[30] Ibid. The need to "peedle" research results often characterizes innovation in complex organizational settings in capitalist countries as well.

[31] Ibid.

The right to employ personnel includes authority for hiring, firing, promoting, assigning and redeploying personnel in a flexible manner to achieve the institute's missions.[33] This right should be seen in light of more widespread discussions of demands from the scientific community for a greatly liberalized labor market for technical personnel.[34]

It is difficult to generalize about reforms in the research system from these scattered examples, since there is a great deal of variation across China in the relations between research institutes and production units. However, on the basis of discussions held by the author with Chinese officials in Beijing in March, 1981, it appears that there is the intent to promote the kinds of activities described above nationwide as a matter of policy.

The essence of the reform thinking is to achieve a new blend of state supported research and contract research, with the latter coming to occupy a considerably larger share of the total. The blend is to be matched by organizational differentiation intended to create a research system composed of the following types of units.[35]

The first type, to be supported largely out of the state budget as in the past, includes large scale institutes engaged in highly advanced and often expensive areas of research. Most of the institutes of the CAS would fall into this category, as would many of the larger ministerial institutes. Work in these institutes of the first type will continue to be governed by national plans, although researchers are to have more latitude in choosing projects than in the past, and will be free to do contract research or serve as consultants once responsibilities under the plan have been met.

The second type of institute, also relatively large, is likely to be in the production ministry sector. Institutes of this second type are to have considerably expanded autonomy in choosing research topics, but in return they are to be cut loose from regular funding out of the state budget. Instead they are to have access to seed money from a special research fund to be administered by the SSTC. Most of their income, however, is to come from the sale of research results and technical services to production units. Profits from these sales can be retained except for that which must be repaid to the SSTC.

A third approach will be the termination of the status of some institutes as independent entities under the ministeries, and their incorporation instead into consolidated production enterprises. In effect, this will mean the creation of more research laboratories in new industrial corporations and fewer administratively separate research institute purportedly serving a variety of enterprises under the same ministerial system.

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[32] Shenyang, Liaoning Provincial Service, Sept. 25, 1980. In FBIS, Sept. 26, 1980, S7.

[33] Ibid. The "right" is not yet recognized by the central authorities as the discussion below indicates.

[34] See for instance, Beijing, Xinhua, July 23, 1980. In FBIS, July 23, 1980, L14.

[35] This discussion is based on the Wu Ping interview.

A final innovation is the emergence of what are referred to as "collective research institutes." Like collective economic institutions, institutes of this type are not state owned and therefore do not receive state funds. Instead they must rely solely on the sale of their services for income. An example of such an institute is the Shanghai Household Electric Appliances Research Institute which was established with funds supplied by the collectively owned enterprises of the Shanghai Municipal Household Electric Appliances Co. While its work centers on technical problems in the production of appliances, it also offers research and technical services to customers in other industries.[36]

A research system of the type envisioned above clearly changes the mix of market and administrative mechanisms used for linking research and production placing greater emphasis on the former. However, it also reflects a recognition that research and production in some circumstances are best coordinated administratively if these two functions are within the same organization. What is deemphasized is the idea that applied research institutes, centrally located to serve a number of production units, can be effectively administered centrally through rationalized planning. In this sense, these reforms may be an important step away from assumptions underlying the Soviet model.

However, contrary to the wishes of some in the scientific community, market approaches are not to be fully extended to the allocation of S&T labor. While the regime is willing to encourage individual contract research and consulting, it seems to be unwilling to take the next step, that of abolishing, or at least modifying the principle of the administrative allocation of labor. This is likely to limit the effectiveness of the reform in research administration. In particular, one would expect that the full entrepreneurial potential of the collective institutes probably will not be met if they are denied flexibility in recruiting and dismissing staff.

This observation cannot be made without a qualification, however. Recalling that the introduction of markets is occurring only at the margins of a highly bureaucratic system, it might be argued that a liberalized labor market for technical intellectuals in and of itself would guarantee that the collective sector would be denied quality manpower. This is so because the state sector provides job security and a variety of perquisites ("iron rice bowls") not available from the collective sector, thus the latter's ability to attract and hold quality manpower by relying on market mechanisms would be limited.[37]

While problems with the partial use of markets can be construed as an instance of the "little bit pregnant" syndrome, it is more usefully seen as symptomatic of the deeper institutional dilemma discussed at the outset. A number of other problems with the R&D system can be traced back to the uncertainties of finding the proper blend of markets, administrative structures and normative order. For instance, the Chinese are well aware of the Western phenomenon of innovative high technology companies being spun off from research centers. The Chinese have the research centers, the desire for innovative industries, and a pool of entrepreneurial talent that under the right conditions could make such industries successful. However, Chinese work units are expected to provide most of an individual's social services (apartments, benefits, schools and often shops). All of these would have to be provided administratively by any new industry (which would be expensive, cumbersome and time consuming), or markets would have to be established for all those services (which in the short run would be socially disruptive.) [38]

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[36] Peking Xinhua, July 2, 1980. In JPRS 76100.

[37] For the effects of the "iron rice bowl" syndrome on collective enterprises, see Xue Muqiao, "Reform the Economic Structure and Economic System," Red Flag 14 (July 16, 1980). In JPRS 76503, p. 13.

Institutional uncertainty is also a factor in assessing the desirability of the current drive for more contract research. This policy has the virtue of more effectively linking research institutes with production units. However, it also seemingly exacerbates the already serious neglect of basic or fundamental research which will become an increasingly serious problem as the technological level of Chinese industry becomes more sophisticated.[39] That is, there is a danger that the use of market mechanisms will be excessive and intrude into areas best left to administrative mechanisms.[40]

Related to problems of "market-plan mismatch," is a problem in the planning system itself. Theoretically, the appeal of central planning in research is the capability to provides to ". . . invest and

> Mobilize R. & D. resources on a nationwide scale; to focus and complement resources in the pursuit of national social and economic objectives; to reduce R. & D. redundancy and maximize reforms to society's investment in R. & D.; and to efficiently disseminate R. & D. results and innovations.[41]

The existence of scientific and economic planning in China produces one predictable result. Those units near the top of the hierarchical system tend to have the easiest access to resources, although they may be the least innovative.[42] On the other hand, the fact that there has been extensive decentralization of the administrative structure (even as the primacy of administrative structure over markets has been maintained) means that some of the theoretical advantages of planning are lost.

Decentralization has had the effect of unleashing a great deal of local initiative for R. & D. projects, and it has also effected the availability of resources. Thus units wishing to undertake R. & D. have more than one option in finding support. They can appeal for support to superiors within their ministerial system (who in turn have multiple options for obtaining support), or they can appeal to the S. & T. committees of the local units of government. Since both the ministerial system and the local governments lack experienced R. & D. managers to evaluate the initiatives coming from below, there has been a tendency (given a national policy which has been celebrating the promotion of S. & T.) to automatically approve proposals from below. The system therefore in effect, becomes a project selection and funding system, rather than a true planning system which realizes some of the advantages noted above.[43]

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[38] Fisher, "Do We Stand . . .", pp. 20–21.

[39] William A. Fisher, "The Management of Industrial Science and Technology in the People's Republic of China: Opportunities and Problems," unpublished paper presented at the Conference on Industrial Development in China, U.S. Department of Commerce, Washington, D.C., Feb. 24, 1981.

[40] Since basic research is widely believed to be a "public good", it is often assumed that support for it is best left to governments. It is also difficult to attach an economic value to basic research, although a free "market in ideas" is necessary for an adequate assessment of the value of basic research by a professionally competent community.

[41] Fisher, "The Management . . .", p. 7.

[42] Ibid.

While local initiatives are encouraging as a sign of entrepreneurial energies, they are not always economically rational. Policies which further local initiatives, e.g. the economic reforms of 1979 and 1980), for instance, produced a flood of unnecessary capital construction which represented an irrational use of resources and contributed to a serious budgetary deficit.[44] Funds for "technical renovation" often went for expanding buildings rather than upgrading production machinery.

For instance, in an apparently otherwise well run optical instrument factory in Chonqing, some 2.6 million yuan were invested in expansion of facilities during the last two years, 51 percent of which came from the SSTC. However, of this major investment, only .2 million were invested in machinery and equipment, the rest having gone into the building.[45] One senses that local preference for expansions of this kind which concentrate resources in construction rather than equipment renovation (and which the central authorities now condemn) is a function of patronage opportunities they afford to local elites motivated by particularistic concerns.[46]

Thus, efforts to reform the research system proceed from an uncertain philosophical basis. It is not possible to proceed on the basis of normative consensus since revived particularism clearly demonstrates its absence, and the Cultural Revolution experience is still too fresh in people's minds to try to launch a campaign to achieve normative order. Markets are attractive options since they (1) are new and different and (2) appear to be flexible institutional arrangements for achieving certain modernization goals. However, markets are also problematic because (1) one market based reform points to the need for many more, and (2) market based solutions are not necessarily the most appropriate for all of the problems of the R&D system. Reliance on a philosophy grounded in the primacy of administrative structure merely again brings to center stage the problems of institutional design noted above, especially the problems of innovation characteristic of systems modelled after that of the Soviet Union.

Assuming that the Chinese resolve these institutional problems through trial and error and incremental adjustments, and not through radical shifts in policy, the future of the research system holds more promise. The future role of the institutions of higher education in research, for instance, is likely to expand. As noted above, the research role of IHE's in the past has not been great (although their technical services role is substantial). On the other hand, before the Cultural Revolution, university faculty often also belonged to research institutes proximate to the IHE's. In the post-Mao era this practice has been revived, but in addition, the long-held interest of Western trained scientists in making universities centers of research, seems to have been incorporated into policy as well. It is likely that if large numbers of Chinese scientists continue to study in the capitalist countries, they will upon their return wish to continue the development of the IHE's as centers for research.

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[43] Ibid., and Fisher, "Do We Stand . . ."
[44] Bachman, "Local Interests . . ."
[45] Personal communication from a Western visitor to the plant.
[46] Cf. Bachman, "Local Interests . . ."

By the late 1980's, therefore, China could have a hybrid research system of considerable interest. By grafting on to the existing system a flexible applied R&D and technical services sector (comprised of contract research institutes and intra-enterprise research laboratories) and an active university sector, while maintaining a stable core of high quality research in the academy sector, the Chinese could have the best of both the Soviet and Western models. By the late 1980's the average age of the S&T manpower pool will be relatively low, and both human and financial resources will still be relatively scarce. One can postulate therefore a research system of eager and aggressive researchers in keen competition for limited resources. Finding an effective mechanism for the allocation of those resources will be crucial if such a hybrid system is to fulfill its promise, and the establishment of such a mechanism will be one of the key science policy problems of the 1980's for China.

CHINA'S INNOVATION PROBLEMS

While the development of a productive research system is unquestionably essential for successful modernization, the economic impact of R. & D. will not be felt if the products of R. & D. do not find their way into commercial production. The phenomenon of introducing new products or processes into commercial production is what is normally meant by "innovation" in Western usage. Innovation thus by definition is not strictly a matter of R. & D. Much useful innovation does not necessarily involve "high" or "science based" technology, although for the latter types of technologies the successful coupling of R. & D. and production is a crucial part of the innovation process. As noted above, that coupling has not always been successful in China, and it is not unusual at present to hear factory managers and engineers complain that the work of R. & D. institutes is of no practical use to them, or to have R. & D. personnel lament the lack of interest in innovation on the part of factory management.[47]

Sustained technological innovation in the civilian economy seemingly has been a problem for socialist countries. Programs of innovation expose socialist managers to a variety of uncertainties including those pertaining to supplies of inputs and markets for outputs. Since socialist price mechanisms typically do not adequately reflect the costs of new products (before and after learning effects take hold), the small increment of extra income that could become available to the manager by attempting to innovate is often not worth incurring the risks the decision to innovate entails.[48]

Underlying assumptions about technological progress under socialism set thinking about innovation apart from that found in market economies. In Marxist terms, technological progress, or "the development of productive forces," becomes retarded in advanced capitalism by contradictions with capitalist relations of production. The substitution of socialist relations of production for capitalism therefore is expected to lead to an explosive growth in the productive forces and rapid technological change. Scientific and technological knowledge is freed from proprietary interests and becomes truly public. Furthermore, in this view, the development of knowledge and its use can be rationalized through planning.[49]

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[47] Fisher. "Do We Stand . . .", pp. 15, 16. It should be noted that these problems are not unheard of in Western economies as well.

[48] Joseph S. Berliner, "The Innovation Decision in Soviet Industry," Cambridge, the MIT Press, 1976.

These ideological considerations have contributed to the design of institutions premised on a "natural" flowering of technological progress, particularly the centralized organizations for R. & D., administratively separated from production activities described above.[50] In spite of the fact that leaders of socialist economies have taken an active interest in problems of innovation in recent years, ideology may predispose them to underestimate the difficulties of innovation and provide a convenient justification for avoiding fundamental economic reforms that could make their economies more innovative.

When the post-Mao leaders embarked on the four modernizations program and identified science and technology as keys to the other three modernizations, they did so with at least some recognition of the problems of innovation. For instance, in his speech to the 1978 National Sciences Conference, Vice Premier Fang Yi stated that,

> It is a growing trend that raising labour productivity depends on the application of new technologies. We must take effective steps to change the present situation in which the popularization and application of a large number of scientific and technological achievements have long been delayed. We must first of all overcome the conservative idea among some of our comrades of being content with things as they are, make greater efforts to publicize scientific and technological achievements and new techniques, seriously study and solve the problems that exist in the exchange and popularization of these achievements and change irrational regulations on keeping secrets.
>
> Close attention should be paid to the intermediate links between scientific research and industrial and agricultural production and essential pilot factories and workshops to trial-produce new products should be built or improved.
>
> We should study and formulate appropriate technical and economic policies and encourage the application of scientific and technological achievements. The standards by which production departments are examined should include the application of such achievements and the innovations made in technology. We should actively support their efforts to apply new techniques and improve work processes by providing them with the necessary materials and funds.[51]

Fang clearly believed there is a link between innovation and productivity; he recognized problems of technical conservatism and suggested a strategy for dealing with them. The strategy involved not only the development of a vigorous R&D sector, but also greater efforts in the scientific information and popularization fields, the use of pilot plants to achieve demonstration effects, and reforms in the decision rules and incentives affecting micro-economic decisionmakers.

Chinese thinking about the relationship between knowledge and innovation is changing as current efforts at economic reform proceed, and increasingly reflects the underlying philosophy of the latter. Whereas Fang Yi's 1978 statement to the National Science Conference indicated an understanding of innovation, which might be characterized as "R&D driven" or "supply pushed", by 1980, Fang's statements focused more specifically on factors influencing decision rules and incentives within enterprises, such as new approaches to cost accounting, profit distribution, taxation, depreciation and price policy.[52]

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[49] As one Chinese commentator recently put it, "Since socialism freed scientific labor from the shackles of the capitalist system of private ownership, scientific research can now be reasonably organized and adapted to the needs of society . . ." Chen Changshu, "A Talk on the Characteristics of Scientific Labor," Red Flag 12 (June 16, 1980). In JPRS 76296, p. 63.

[50] Cf. Berliner, pp. 98–99.

[51] Beijing, Xinhua, Aug. 26, 1980. In JPRS 76410.

In spite of this shift of focus, Chinese concepts that come closest to "innovation" fail to capture the sense of process leading to commercial application that the English term denotes in its technical definition. No one Chinese term quite connotes what is meant by "innovation." Instead Chinese often speak of inventions (fa ming) which then should be popularized (pu ji) as two somewhat discrete activities. These terms connote very little about decisions to adopt new technology. Some sense of process and managerial decision making is implied by the term ge xin, but the latter term is normally best rendered as renovation, although it is often used with reference to the renovation of technology in production units.

Western analyses of innovation in China have often begun with an analysis of industrial structure. These analyses reflect a general agreement that although the large scale centrally controlled enterprises may contain the most advanced machine-embodied technology, they are not typically the most technologically innovative.[53] Heymann, for example, looks to laboratory industry and to medium scale urban industry as the leaders in innovation.[54] Baum notes, that "opportunities for managerial entrepreneurship and organization innovation" are "relatively restricted in state enterprises." [55] Rawski develops the most complete argument for the technological progressiveness of the small and medium sized urban industries. These firms usually are found in centers of pre-liberation industrial activity—with Shanghai being particularly notable—and most of them have their origins in the pre-'49 period. While they were largely neglected in investment decisions during the First Five Year Plan Period, they survived and became crucial sources of technological progress following Soviet withdrawal in 1960. Rawski attributes to them China's ability to launch entirely new industries (petroleum, chemical fertilizers) largely on the basis of indigenous resources. Their innovative capabilities in Rawski's view, lie in their avoidance of diseconomies of scale, in an entrepreneurial tradition going back to the pre-'49 period and in the skilled and experienced work force they possess.[56]

Chinese capacity for technological innovation has been strongly influenced by the impact of central economic planning on microeconomic decision making. In principle, Chinese enterprises since the mid-1950s have been expected to meet eight standard planning targets which until recently included output, quality, variety, consumption of raw materials and energy resources, labor productivity, cost, profit and the rate of utilization of circulating funds. The impact of planning on "the innovation decision" in China has been similar to that in the Soviet Union. In both countries the physical output target has been taken much more seriously by managers than the others. This has often led to a neglect of innovation-related targets. Both economies experience serious uncertainties of supplies, which reinforces tendencies toward managerial risk aversion. Managers in both countries adopt strategies of hoarding and inventory building designed to "buffer" their uncertain environments to insure that physical output targets can be reached.[57] In China however, risk aversion also has a political cause in the highly unpredictable politics that has characterized the system in the past. Interestingly, the types of particularistic political behavior noted in the introductory section are strikingly similar, behaviorally, to the practices of hoarding and inventory building.

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[52] Fang Yi. "Several Current Problems in Scientific and Technological Work," Red Flag 2 (Jan. 16, 1980) In JPRS 75317.

[53] Rawski. China's Transition. . . .: Hans Heymann, Jr.. "Industrial Structure and Technological Advancement in the People's Republic of China," paper presented to the OECD Seminar on Science and Technology in the People's Republic of China, Paris, Jan. 20-23, 1976: Richard Baum, "Latent Interests in Chinese Industrial Enterprises: A Structural Analysis and Overview," paper presented at the workshop on the Pursuit of Political Interests in the People's Republic of China, Ann Arbor, Aug. 10–17, 1977. These assessments are consistent with more recent information reported by Fisher in the two papers cited above.

[54] Heymann, "Industrial Structure . . .".

[55] Baum, "Latent Interests . . .".

[56] Rawski, "China's Transition . . ."

There is general agreement among Western analysts that the planning system in China has been considerably less "taut" than that in the Soviet Union. This has been due in part to an underdeveloped statistical system, to a shortage of trained economic administrators, and to the structure of the inherited industrial economy. But perhaps the most important reason is the degree of decentralization of the economy which was intended to, and apparently has achieved the incorporation of local interests into the planning process.

Decentralization has meant that many enterprises are subject to multiple administrative authorities, a fact which makes it difficult for outsiders to understand the operation of incentives and controls in individual factories. The accommodation of the interests of these authorities has often entailed the diversion of resources from productive activities. Depending upon how one accounts for these resources, they can be viewed either as having been allocated (to meet sociopolitical demands) and are therefore not available for economic purposes, or as a substantial amount of "slack" in the system that could be recovered through economic reform.

One gets a sense of this situation from the following types of accounts. Reports on a plant in Kunming indicate that it is under the general jurisdiction of the central Ministry of Metallurgy which supervises its output. Provincial authorities however monitor the plant's profit performance. On personnel matters the plant is responsible to the city, and local bureaus of planning, construction, and communications have influence on other spheres of the plant's activities.[58] Assuming such multiple jurisdictions have been common throughout China, it is understandable how administrative authorities in Jiangsi are able to ". . . expropriate an enterprise's truck for a few days, or demand workers to help carry vegetables to market . . . Jiangsi radio reported that whenever personnel shortages exist, provincial departments simply appeal to factories for voluntary manpower transfers even for tasks such as running exhibitions, militia training or repairing public squares. Not only are plans upset but many factories are never recompensed.[59]

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[57] Thomas G. Rawski, "China's Industrial System," In U.S. Congress, Joint Economic Committee, "China: A Reassessment of the Economy," 1975, pp. 181–182; see also, Shannon R. Brown, "Foreign Technology and Economic Growth," Problems of Communism (July-August 1977), p. 37.

[58] China Business Review, March–April 1979, p. 56.

Administrative controls in China over the economy's financial arrangements and its price system, in obscuring the true costs of economic activities, have effected approaches to innovation as well. In the financial area, there has often been a lack of direct connection between investment funds and economic performance. Relatively costless investment funds have been available either through the state budget or through bank loans (which in the past did not carry interest charges). Given the priority of output targets and general supply uncertainties, such funds would often be used to pursue a strategy of vertical integration. Rawski notes that the acquisition of well-stocked machine shops has been especially prized as a means for reducing reliance on outside supplies.[60]

Administrative controls over allowable depreciation have also hindered innovation and are now being reformed. Current proposals call for the shortening of the depreciation cycle which in many industries has been as high as 25–40 years to 10–15 years, an increase in the allowable annual rate of depreciation to 6.5 percent–10 percent and greater discretion at the enterprise level in using depreciation funds. [61] It should be noted that while the depreciation cycle in some industries has been excessively long, in some high technology industries, including electronics, reportedly it is quite short.[62]

The reliance on administrative mechanisms for establishing prices in China has also had effects on innovative behavior. It is not known whether price irrationalities produce the kinds of disincentives for innovation that are known to exist in the U.S.S.R., but serious irrationalities do exist. In spite of the fact that there has been some liberalization of pricing in the last two years, firms still cannot easily raise prices (although there is some room to lower them) to reflect the risks involved in producing a new product. There are loopholes however. In the retailing of consumer goods for instance, new products are often introduced having an "experimental status". As such, prices can be set locally. Not surprisingly, producers try to maintain the "experimental status" as long as possible.[63]

Recently, administratively enforced ceilings on prices in the face of growing inflationary pressure have put factory managers in a bind. This situation has had an unexpected effect on product innovation however. Faced with rising costs and price limits on old products, enterprises have found that it is in their interests to introduce new products which qualify for higher prices.[64]

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[59] Ibid.

[60] Rawski, "China's Industrial System," p. 183.

[61] For discussions of the depreciation issue and the availability of financial resources for innovation more generally, see Ren Tao, Sun Hualyang and Liu Jinglin, "Investigation Report: Enterprises in Sichuan Province Acquire Greater Independence," Social Sciences in China, 1 No. 1 (1980), pp. 201–215; Erik Baark, "Techno Economics and Politics of Modernization in China: Basic Concepts of Technology Policy under Readjustment of the Chinese Economy," Discussion paper No. 235, Lund, Sweden, Research Policy Institute, University of Lund, November 1980, pp. 20–27. See also, Wang Binggian, "Report on Financial Work."

[62] Personal communication from William A. Fischer.

[63] These points were made by Prof. Richard H. Holton of the University of California, Berkeley, School of Business in a public lecture at the University of California, Berkeley, on Feb. 5, 1981. A useful discussion of current pricing practices is found in Richard H. Holton, "Marketing: Domestic and International," unpublished paper presented at the Conference on Industrial Development in China, U.S. Department of Commerce, Washington, D.C., Feb. 24, 1981. I am grateful to Professor Holton for sharing this paper with me.

The incentive structure resulting from administrative controls over the economy, when combined with past normative appeals for self-reliance in technological innovation have contributed to a degree of technological autarky in Chinese firms. The prevalence of a wide variety of locally produced (sometimes appearing to be "gerry built") production equipment in Chinese factories indicates no lack of inventiveness. While such inventiveness can be viewed as a response to normative appeals to self-reliance, it may also be a response to economic and political signals as well. For instance, a manager faced with excess labor which he is politically bound to retain, may find procuring advanced equipment from another unit unattractive; particularly if as is often the case, the new equipment does not come with spare parts. Under such circumstances, the preferred decision could be to make technically less sophisticated new equipment oneself (or modify old equipment) and rely on the available labor to maintain it.[65] Thus traditions of vertical integration and self-reliance may be rational and supportive of innovative potential at the local level. However, in the context of the economy as a whole, they may impede innovation. As Fisher has nicely put it,

> Self-reliance impedes the flow of technical information and the diffusion of innovation because there is no formal logic or predictability for the appearance or sharing of innovations. Furthermore self-reliance thwarts 'worker pressures' for innovationary activities, reduces the likelihood for funding R&D by prospective customers and reduces the production volume which can be expected for any potential innovation. All of these factors discourage technological advance at the national level.[66]

More generally, the tradition of self-reliance (backed by the incentives noted above) frustrates the kind of economic integration which is likely to represent a major gain in innovation. Two striking features of the Chinese economy and its technological development are its diversity and an apparent lack of balance in its development. There are great regional differences in factor endowments and levels of modernization. These are crosscut by different levels of sectoral development. While China is still an overwhelmingly poor agricultural country, it is also one which has demonstrated a measure of technological capability with the successful completion of impressive technological projects. While it may be an overstatement to say that the Chinese economy is many economies, it is not too much to say that it is at least two or three.

The "unbalanced development" of the economy has undoubtedly resulted in excess capacity in some sectors of the economy creating "slack" which could be tapped for innovation in the face of a more disciplined economic environment. More active transfers of resources from one sector to another in some sort of non-zero sum fashion is already taking place in some industries, and others are planning for them. The defense sector, including defense industries and defense R&D installations, has long enjoyed priority investments from the state and now finds itself with considerable excess capacity. During the last few years it has begun to move actively into the domestic civilian economy and has shown an interest in the export economy as well.[67] As many as 80 percent of the enterprises in the defense sector are now producing some civilian products, and it is expected that 30 percent of the value of their output will be in civilian products this planning year.[68] In Guangdong, the value of civilian products from the defense sector amounted to almost 30 percent of the total value of production in the province in 1979.[69]

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[64] Personal communication from William A. Fischer.
[65] Holton, lecture.
[66] Fischer, "The Management of . . ."

While it is by no means clear that the active involvement of defense industries in the civilian economy represents the most efficient use of the nation's resources, these industries do represent significant concentrations of scientific and technological assets. That defense industries now articulate with the civilian economy makes it more likely that those assets will be used to enhance innovative capabilities than if there were only a minimal connection with the civilian economy.

The civilian machine building industry has also enjoyed a favorable investment position over the years, and now represents a significant concentration of human and technological resources. However the industry has failed to meet its potential in terms of the other sectors of the economy it serves, the quality and diversity of its products, its own internal organization, and neglect of its own machinery.[70] Historically it has served heavy industry at the expense of the rest of the economy, and has expanded by building new factories instead of renovating equipment at old ones. In addition it has failed to offer customers complete packages of products and services, it has neglected the export market, and has concentrated on physical output at the expense of quality, variety, and punctuality of delivery. Reforms have been instituted to raise ". . . the ability of the machine building industry to satisfy various social needs . . ." [71] Promises of reform are not the same as actual reform, but again, we see in the machine building case a core of concentrated technological capabilities (as well as productive capacity) that could become widely diffused with the right formula for economic integration.

Although the cardinal choice of an administered economy in the 1950's has contributed to economic integration in some ways, in others, it frustrated integrative trends. The socialization of the economy had the effect of imposing administrative structure on pre-existing "natural" economic regions and of directing the further development of the economy according to administrative criteria.

According to economist Xue Muqiao,

> Since the socialist transformation of capitalist commerce and trade we have disrupted the original economic channels and gradually substituted administrative centers for economic centers. If the economic contacts between Shanghai and southern Jiangsu have to be channeled through Nanjing and the economic contacts between Shanghai and the Liaodong Peninsula have to be channeled through Shenyang, this will surely complicate the procedure and increase the costs, resulting in a great waste of time and money.[72]

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[67] Fox Butterfield, "China's Military Industry Pursues Civilian Markets," N.Y. Times, June 1, 1980, p. 8; Li Chun, "Military Industrial Enterprises Must Learn Two Sets of Skills," Nanfang Ribao, Jan. 1, 1980. In JPRS 75104, p. 39.

[68] Beijing, Xinhua, Aug. 13, 1980. In FBIS Aug. 14, 1980.

[69] "Guangdong Military Industrial Enterprises Actively Produce Civilian Products," Nanfang Ribao, Jan. 12, 1980. In JPRS 75104, p. 37.

[70] Zhou Zijian, "Structural Reform and Direction of Development of the Machine Building Industry," Red Flag (June 1, 1980). In JPRS 76248, pp. 34–35.

[71] Ibid.

[72] Xue Muqia, "Reform the Economic Structure . . ."

The gradual reaffirmation of the role to be played by natural economic centers seemingly is a step toward finding the right formula for integration [73] as is the liberalization of transprovincial commerce. Consumers of electrical machinery in Tianjin who in the past were instructed to "buy Tianjin," are now free to purchase equipment of superior quality (from Shanghai). This change not only forces economic discipline on Tianjin producers,[74] but it also contributes to more effective internal technology transfers.

A variety of other forms of trans-provincial economic integration have been reported during the last year ranging from joint ventures (where one partner supplies technology and equipment and the other provides labor, raw materials and sites) and compensation trade, to direct investment schemes by which rich and advanced enterprises provide funds for expansion to poorer units in return for a share of the profits of the latter. Shanghai reportedly has already organized ten trans-provincial corporations which facilitate extension of Shanghai managerial, capital and technological capabilities to firms in less adanced regions.[75]

There has also been a growth in hybrid forms of industrial ownership and management involving the state, collectives and individuals. These are reportedly making improved used of underutilized financial and human resources, and are contributing to "the development of the productive forces." [76] In spite of the fact that some of these hybrids have been able to capture resources intended for efficient state-owned factories,[77] their flourishing suggests a trend toward economic integration involving highly flexible "feeder industries" providing inputs to both medium and large scale enterprises, and being the recipients of technological feedback in return. The hybrids also can be expected to be a much needed source of product innovation as well.

Should more effective integration be achieved, one would expect more widespread incremental technical progress based on the diffusion of one or more "core technologies." [78] This model of innovation which has been operative in China in the past is one of an economy consisting of enterprises of different sizes, objectives and capabilities, in which technical progress is spun off from centers possessing advanced skills and technical knowledge in a far more innovative fashion than one might initially suspect. Such centers do exist in China, but the excesses of an administered economy and the obstacles to economic integration they have created have limited their innovative impact. Recent reports of skilled workers from Shanghai, many of them retired, serving as technical advisors in less developed regions of the country with preferential pay and living conditions suggest that the Chinese now also place value on the "diffusion from the core" concept of innovation.[79]

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[73] Ibid.

[74] Xinhua Commentary, "Break Down Barriers, Protect Competition." Beijing, Xinhua, Aug. 7, 1980. In FBIS, Aug. 13, 1980, p. L12.

[75] For discussions of these developments, see Xue Muqiao, "Reform the Economic Structure . . .", p. 25; "Various Forms of Economic Integration," Beijing Review 32 (Sept. 29, 1980), pp. 4-5; "Joint Venture in Zhejiang," Beijing Xinhua, July 4, 1980. In JPRS 76100, p. 3.

[76] He Jianzhang, "Newly Emerging Economic Forms," Beijing Review 21 (May 25, 1981), pp. 15-18.

[77] Ibid., cf. Bachman, "Local Interests . . ."

[78] See. Nathan Rosenberg, "Perspectives on Technology," Cambridge, Cambridge University Press, 1976, chapter 1.

[79] Beijing, Xinhua, Aug. 23, 1980. In JPRS 76401.

When the potential benefits resulting from economic integration are added in with the existence of an extensive R&D system and established networks for disseminating S&T information and upgrading human capital, China's future innovative capacity appears promising. In spite of the unfortunate legacy of efforts to emulate the Soviet model in the 1950's, native Chinese entrepreneurship has not been stifled. Indeed, the evidence from the last two or three years in both the R&D sector and the industrial economy more generally is that there is enormous initiative at work in factories and institutes.[80] In addition, the chief engineers at Chinese factories have impressed foreign observers as a savvy bunch who understand and cultivate the technological "gatekeepers" and "product champion" roles in their enterprises.[81] China's problem therefore may be less one of stimulating interest in innovation than one of channeling innovative energies in the proper directions. However, defining "proper" and determining the channeling mechanisms again becomes a matter of institutional choice. The problematic relationship between stimulating innovation and the dilemmas of institutional reform are nicely illustrated in the quest for a system to reward inventions.

As we have seen, when the Chinese leadership initiated new policies for S&T in 1978, they were not unmindful of the problems of innovation, and the importance of providing incentives to innovate. One policy response has been the repromulgation of regulations for rewarding inventions. The regulations provide for four grades of awards, each carrying a certificate, a medal and a cash award from 1,000 to 10,000 yuan. To qualify for an award, a project must be truly novel, "advanced" and proven "applicable through practice."

The Science and Technology Commission has been authorized to review and decide on inventions qualifying for awards. The program has been actively implemented since its establishment in late 1978; reportedly 103 inventions were approved during 1979 (and "nearly 1,000 new products trial produced") and 32 were selected for recognition during the first half of 1980.[82] In addition to the SSTC-run program, other organizations have also initiated awards for technological achievements. In April, 1980, for instance, the First Ministry of Machine Building recognized 284 technological projects with awards, 87 of which ". . . have either approached or reached the advanced international level."[83]

The awards program is an interesting illustration of how uncertain institutional philosophy makes it difficult to maintain policy continuity. The program is in effect a dusted off version of an incentive scheme that was introduced in the 1950's. As such it reflects the institutional assumptions of administrative control and of supply driven innovation discussed above.[84] The 1950's awards program was gradually phased out as material incentives were deemphasized and as the quest for a normative order intensified during the 1960's. That the past quest for a normative order had success is indicated by the persistence of Maoist egalitarianism in the implementation of the current system. For instance, Article VIII of the regulations states:

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[80] cf. Bachman, "Local Interests . . ."; and Fisher, "The Management of . . .", and "Do We Stand . . ."

[81] Fischer, "Do We Stand . . ." Gatekeepers monitor the environment for new information of relevance to innovation and take responsibility for seeing that it reaches those in an organization who need it. Product champions are advocates of potential innovations who are willing to do battle with the forces resistant to change in firms. Both roles are regarded as quite important for innovation by Western students of complex organizations.

[82] Beijing, Xinhua, Sept. 11, 1980. In FBIS, Sept. 23, 1980. (Supplement); Beijing, Xinhua, July 16, 1980. In FBIS, July 22, 1980, L19.

[83] GMRB, Aprril 12, 1980. In JPRS 76187. This report describes briefly some of the projects recognized.

[84] For an examination of the 1950's awards program, see Richard P. Suttmeier, "Research and Revolution," Lexington, Mass., Lexington Books, 1974, p. 61–62.

> Cash rewards for inventions by collectives should be reasonably divided among members according to their respective contributions. Cash rewards for inventions by individuals should be issued to these individuals.

Seemingly this article spells out a distinction between individual and group rewards. In practice, however, individual recipients of have been expected to share the cash award with members of their work units, including non-professional staff.[85] This expectation is not contained in national policy, but is rather the result of local peer pressure based on past policies of egalitarianism and non-material incentives. Thus administrative order is at odds with normative order.

Administrative order is also at odds with market order. Article IX reads:

> All inventions belong to the state. All units throughout the country (including units enforcing the system of collective ownership) may make use of inventions as needed.

As the reforms in the R&D system discussed above indicate, greater reliance on market forces is being tried and this in turn has led to an evolution in thinking about intellectual property rights. Current discussions of the adoption of a patent system take issue with some of the provisions of the awards program.

> The "Regulations on Awards for Inventions" currently in force in our country do not completely comply with the requirements of the development of science and technology in China, nor can they satisfy the requirements of international cooperation. It is necessary to formulate a patent law and establish our patent system as soon as possible.[86]

In addition, increasing stress is being put on competition between enterprises in the hope that competition will stimulate better economic performance. While calls for competition are usually accompanied by statements of expectation for continuing inter-enterprise socialist cooperation, the trend is clearly toward cooperation through market exchange. The considerable difficulty of placing value on knowledge and technology, which will be necessary if market exchange is to work, seemingly is not facilitated by the provisions of Article IX which treat inventions as a free public good.

CONCLUSIONS

While in many ways China is a poor, underdeveloped country, it is endowed with resources for technological innovation which set it apart from most other countries. These include an extensive research system, technically advanced sectors of the industrial economy, an abundance of entrepreneurial talent and a workforce with a propensity to upgrade its skills. These resources have been terribly underutilized. Institutional reforms now being tried are intended to achieve more efficient resource use by creating greater economic discipline and by fostering a higher level of economic integration. The political environment for the reforms is complex however, and remains unpredictable in part because of uncertainties over institutional philosophy.

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[85] Private communication from a recipient of an individual award.

[86] Xia Shuhua, "It is Entirely Necessary to Establish a Patent System," RMRB, June 19, 1980. In FBIS, July 9, 1980.

In this context, China's expanded international economic relations assume a special importance. These not only have direct implications for the development of innovative capacity, but indirectly, they also pertain to the problem of institutional choice. The direct effects can be expected as a result of greater foreign participation in the Chinese economy. This participation—through joint ventures and compensatory trade, and the sale of goods and services to China—establishes more mechanisms for technology transfers than existed in the recent past. Indirectly, a foreign economic presence in China, and the export market to which China is committing itself, provide the economy with objective success criteria for evaluating enterprise performance. One would expect, as a result, a stronger sense of discipline in economic management, and a general reinforcement of the thrust toward rationality and efficiency embodied in the domestic reforms. For example, an impact of foreign economic relations is already evident in a new concern for quality control and modern marketing.

New international economic relations are not limited solely to commercial ties. China has also opened itself to international development assistance agencies, such as UNDP, and has become a member of the World Bank. Relations with the latter are just beginning, but informed observers expect large scale Bank assistance to China within the next 5 years. This relationship is potentially of profound importance, not only for the direct assistance that will result from it, but again, for the indirect consequences it will have for Chinese institutional reform. International development agencies are potentially powerful, tacit allies for Chinese proponents of reform who would seek to break out of the cyclical self-defeating patterns of the political economy described earlier in this paper.

It would be a mistake to overemphasize these international ties. Chinese politics is still driven largely by internal forces, and the possibility of attenuating international relations as a result of either domestic or international political developments is always real. Nevertheless, for the reasons given, these ties are a new and important factor. The direct benefits from them at this point in China's development are particularly great, and this fact provides leverage for those who would care to use it.

Innovative technological development has been likened to sailing; both a wind and a rudder are needed. Whereas capitalist economies tend to have lots of wind but not too much rudder, the Soviet case often seems to all rudder but no wind.[87] The Chinese case is more difficult to interpret. The wind is more unpredictable than in capitalist economies, but it is clearly there. Because the wind is unpredictable it is easy to "lose" if the rudder is faulty. We have suggested above that the integrity of the rudder is in doubt in part because of the intense stresses placed on it in the past. Thus, the need today is not for another "great helmsman" but for rudder builders of consummated skills.

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[87] This metaphor was suggested by Wassily Leontief at the Symposium on Japan's Technical and Economic Challenge and the American Response, University of California, Berkeley, Mar. 30, 1981.

CHINA'S CAPACITY TO ASSIMILATE FOREIGN TECHNOLOGY: AN ASSESSMENT

By Denis Fred Simon *

OVERVIEW

China's ability to assimilate foreign technology is severely constrained by four factors: (1) uneven performance with respect to translating research results into the serial production process; (2) poor management capabilities, particularly in such areas as project integration and industrial organization; (3) technical backwardness, particularly in precision instrumentation and testing equipment; and (4) insufficient numbers of qualified S. & T. personnel to assist with the management and adaptation of imported technology. These problems are critical constraints in both the civilian and military sectors. Although the Chinese have made appreciable progress during the past several years at remedying many of their deficiencies, most of the above are deep-seated problems with only long-term solutions. The Chinese must first upgrade their basic capabilities in such fundamental areas as alloy processing, computer and electronics development and applications, and systems management before imports of foreign technology will have an appreciable impact on their modernization program.

A. INTRODUCTION

Harnessing science and technology to serve the needs of national development has been an integral part of China's "four modernizations" program. The Chinese leadership views the upgrading of domestic S. & T. capabilities as a catalyst in the modernization of agriculture, industry, and national defense. Since the fall of the Gang of Four in late 1976, continuous efforts have been made to improve the functioning of the S. & T. system and to promote the rapid advancement of Chinese science and technology. Without an adequate S. & T. base, China's leaders correctly believe that the "technology gap" between China and the West will not only remain large, but will tend to widen over time. Moreover, modernization of S. & T. capabilities is viewed as an essential part of China's continuing goal of achieving a greater degree of national technological self-reliance.

One of the major facets of the "four modernizations" program has been an increased Chinese willingness to purchase foreign technologies and acquire foreign technical assistance in support of economic development. Although the use of foreign technology is not new to China, the present openness of the Chinese economy to foreign par-

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ticipation is in some respects highly unique. Never since its coming to power in 1949 has the Chinese government maintained as many S. & T. contacts on as broad a level at one time. China has not only acquired foreign technology through commercial channels, such as whole plant purchases or the importation of machinery and equipment, but has utilized government-to-government S. & T. agreements and educational exchanges as vehicles to secure guidance and assistance for overcoming many of its domestic S. & T.-related shortcomings. Although China's strategy for using foreign technology has undergone substantial domestic criticism and modification during the last year or two, the present leadership remains committed to maintaining its S. & T. relations with the advanced nations and borrowing technology from the West.

One important consequence of China's experiences over the 1978–81 period has been an increased awareness of its own domestic S. & T.-related deficiencies and the shortcomings contained within its policies for foreign technology acquisition. As one commentator in the Chinese journal Economic Management recently suggested, ". . . in the 1970s, and especially 1978, the work of introducing technology was wrong in direction and strategy."[1] In particular, proponents of increased technology borrowing over-estimated China's technical capacity to absorb foreign technology and to achieve desired economic benefits. The use of advanced science and technology by themselves is no longer viewed as the sole solution to China's economic ills or technological backwardness. Some basic changes in both science policies and technology acquisition strategy have been implemented. The reformulation of technology import policies is designed to better reflect China's existing technical capabilities and resources, and to better accord with the country's limited financial capacity to purchase large quantities of foreign technology.

The purpose of this paper is to examine the Chinese experience in assimilating foreign technology over the last few years, and to highlight China's strengths and weaknesses regarding its ability to efficiently and effectively apply foreign technology within the economic system.

The issue of technology transfer is one that has been the focal point of intense international debate and controversy over the last few years. Within the context of international fora, such as the UN Conference on Science and Technology for Development (UNCSTD), the nations of the Third World have tried to increase their access to the world's pool of technology and to improve the terms upon which this technology is made available to them. One of their main goals has been to ensure the use of more "appropriate technologies" within local production processes. Most criticisms have been directed at the "supply side" of the transfer process and the business practices of the major vehicles for technology transfer, such as the transnational corporation.[2]

In spite of these criticisms, however, there has been a growing recognition that the technology transfer issue is as much a problem on the "demand side" of the equation. In other words, the effectiveness of any technology transfer mechanism is greatly dependent upon the capability of the user to absorb the technology. The crux of the problem usually is not the technology itself, but rather inadequate institutional structures and the lack of an indigenous technical capacity to direct foreign technologies toward the solution of economic problems. This relationship was clearly stated by Dilmus James in his analysis of technology absorption in the case of Latin America:

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[1] Chen Weiqin, "The Direction of Introducing Technology Should be Changed," Jingji Guanli, Apr. 15, 1981, pp. 22–25.

[2] Samuel Rosenblatt, ed. "Technology and Economic Development: A Realistic Perspective," Boulder, Westview Press, 1979.

> There is convincing evidence that indigenous research and technological borrowing are strong complements. Individuals who have had experience in coping with a particular set of local problems will be in a better position to participate in the transfer of knowledge. Indeed, they will be in a better position to ask the right questions. And they will be better equipped to select appropriate techniques. . . . Indigenous research activity is thus very essential to economic development, even if it does not immediately result in technical know-how."[3]

The Chinese experience over the 1978–81 period reflects the importance of these factors and the costs that are incurred by virtue of their underdevelopment within the recipient country.

B. TECHNOLOGY AND THE ACQUISITION PROCESS

Students of development generally agree that foreign technology has an important role to play in the process of economic growth. Kuznets, for example, has suggested that one of the advantages afforded to the developing nations today is their opportunity to borrow from the international pool of technical knowledge. Technology, as used in this paper, is defined as "the know-how necessary for the productive functioning of an enterprise." The term includes process (engineering), management, marketing, and production know-how.[4] Other definitions may be more comprehensive, but this particular definition is useful because it specifies not only the forms that technology may take, but also its most essential applications.

Technology can be conceptualized in several ways. Three different categories of technology are distinguished in this paper: (1) general technology—which tends to have universal application and is neither product or process specific; (2) system-specific technology—which is directly related to a specific production process; and (3) firm-specific technology—which refers to the particular mode of production used by an individual company to manufacture a specific product.[5] Depending upon the context and the industry, these different forms of technology can be transferred in "embodied" or "disembodied" form. In the case of the former, the know-how in question is contained within a particular piece of equipment or machinery, or within a turnkey plant. By acquiring the entire item, one thereby acquires the technologies. In contrast the disembodied technologies usually are not contained within a particular item but are transferred as information to the potential users for their own development and application.

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[3] Dilmus James, "The Economic Case for More Indigenous Scientific and Technological Research and Development in LDCs," in James Street and Dilmus James, ed. "Technological Progress in Latin America," Boulder, Westview Press, 1979.

[4] Fund for Multinational Management Education, Public Policy and Technology Transfer (volumes 1–4), New York. March 1978.

[5] Ibid.

Technology is transferred when information and know-how, as well as physical items, are transmitted from one place to another. Among the many vehicles for transfer are (1) equipment sales; (2) design contracts; (3) licensing contracts; (4) management contracts; (5) foreign direct investment, including joint ventures; (6) marketing agreements, and (7) training programs. If we want to include "noncommercial" vehicles, we might also consider bilateral S. & T. cooperation programs, bilateral education exchanges, and the exchange of technical literature through open publications, such as scholarly and trade journals, manuals, and various forms of media communication.

Some mechanisms of technology transfer are more common than others, such as licensing and direct foreign investment. Those that analyze the technology transfer process generally agree, however, that the most effective method of transferring technology is one that involves the close interface between supplier and recipient. This is especially true in view of the fact that most technologies (embodied and disembodied) reflect not only the specific needs of the original user, but also the particular socio-political and economic environment in which the technology was developed. Close interaction is useful in order to facilitate adaptation when and where necessary. More importantly, the essential mechanism of technology transfer is one of agents and not agencies—"it is one of movement of people among establishments rather than the routing of information through a communications system."[6] Accordingly, progress in the technology transfer process is greatly dependent on the technical capabilities of the participants, and the ability of the recipient to diffuse the technology once it is received from the supplier. Moreover, unless technology can be successfully "diffused" once it has been transferred, "technology enclaves" may develop and most of the potentially beneficial, long-term effects of the transfer will not appear.

C. BACKGROUND

The problem of technology assimilation has been a high priority issue on the agenda of the Chinese people since the latter part of the Ch'ing dynasty (1644–1911). Faced with the problem of Western incursion and China's shrinking political autonomy, various Chinese leaders attempted to harness Western science and technology to respond to the Western challenge. By combining the "best" elements of Chinese culture with the tools of Western technology, the Chinese hoped that they could strengthen their society to face the threat to their national sovereignty. It rapidly became apparent to many in China, however, that the absorption of science and technology from abroad also entailed various socio-political and cultural changes as well. The fabric of Chinese society and institutions revealed itself to be ill-suited to make the wholesale importation of technology a viable alternative. By the end of the dynasty and well into the twentieth century, the task of developing an effective strategy to synthesize elements of Eastern culture and Western technology remained unfinished.

Since 1949, China's policies regarding the importation of foreign technology reveal an alternating pattern of shifts between periods of extreme self-reliance and selective foreign borrowing. Although this pattern is less definitive in relation to China's imports of machinery and equipment, it is well-defined regarding the purchase of whole plants and related items. These shifts have been mainly the result of political competition between two major groups, one characterized by its strong advocacy of national self-sufficiency and articulation of radical economic nationalism, and the other favoring foreign technology acquisition and economic intercourse with other nations as a means to enhance the development of Chinese industry and agriculture. In many respects, this latter group has not been opposed to the goals of self-reliance and increased self sufficiency, but have argued that these are long-term goals that can be best achieved through the acquisition of technology from abroad. One direct manifestation of these shifts in policy has been the uneven pattern of industrial growth that has characterized the Chinese economy over the last 30 years.

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[6] William Gruber and David Marquis, ed., "Factors in the Transfer of Technology," MIT Press, Cambridge, 1969.

China's most extensive experience with foreign technology came during the period of close Sino-Soviet cooperation in the 1950s.[7] Over the course of a decade, the Soviet Union conducted a large-scale, comprehensive technology transfer program that included equipment and facilities to support the development of such heavy industries in China as steel, machinery, energy, and national defense. Over 150 key whole-plant projects were supported with Soviet technical assistance. The bulk of the machinery and equipment that came into China arrived as part of whole plant purchases. Estimates suggest that 11,000 Soviet technicians provided guidance and technical advice to China to start-up these projects. Additionally, approximately 25,000 Chinese were sent to the Soviet Union for advanced education and technical training. More importantly, however, the Soviet Union shaped the development of both China's production structure and S&T system—both of which replicated the highly-centralized, heavy industry-oriented Soviet system. It is perhaps in this area where the Soviet Union had its most long-term impact on the economic development of post-1949 China. Although two decades have passed since the Soviet Union rendered direct technical assistance to China, Western visitors continue to report that many of the structural manifestations of the Soviet model loom large in both the conduct of research and the management of industrial enterprises. In many cases, due to lack of any alternative, China's industrial managers and technical personnel remain locked into the use of Soviet designs and specifications for such things as the manufacture of machinery and the production of metal alloys.

From both an economic and political point of view, the Chinese experience with the Soviet Union had an important influence on the development of China's philosophy of self-reliance. The Soviet pullout from China in 1960 was a rather costly lesson to the Chinese. The extent of Chinese dependence on Soviet technology and assistance became readily apparent as China attempted with great difficulty to complete many of the projects that had been started during the period of Soviet tutelage. The lesson was one that would continue to pervade policymaking efforts regarding technology imports over the next two decades. One positive result, however, was the fact that the Chinese were forced to assume responsibility for completing many of the Soviet-inspired projects, and, as a result, through the process of trial and error and the copying of Soviet designs, the Chinese were able to develop a significant indigenous technical capability. Unfortunately, this technical capability was "problem-oriented," rather than "innovation oriented," and thus did not contribute in a major way to the development of innovation or basic design capabilities within the Chinese R&D or production systems.

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[7] Hans Heyman, "Acquisition and Diffusion of Technology in China," in "China: A Reassessment of the Economy," Joint Economic Committee, 94th Congress, 1st session, July 10, 1975, pp. 678–729.

China's next major phase of importing foreign technology and equipment came during the early 1960s (1962–66) in the aftermath of the Great Leap Forward (GLF). In its simplest form, the Great Leap Forward was an economic campaign initiated by Mao that was designed to speed up the pace of China's economic growth and to promote local self-sufficiency in both rural and urban areas. In many respects, the policies associated with the Great Leap Forward were ill-founded, resulting in great problems for the Chinese economy.

The decision to import additional plants and expand equipment purchases after the GLF was apparently designed to remedy some of the production shortfalls that China was experiencing because of GLF policies. Although the Chinese had ordered over 100 additional new plants in the late 1950s from the Soviet Union, many of these never were delivered due to the Soviet pullout, and among those that were delivered, final completion was significantly delayed. There are also some indications that the Chinese were interested in whole plant acquisitions at this time for purposes of reverse-engineering and copying. In the case of one petrochemical plant imported from the Dutch. such an effort was made, but it appears that the Chinese were not completely successful. Overall, the entire technology program of the early 1960s was a modest one from the standpoint of both plant scale and financial costs. Its unique feature was the new source of most of the items—Western Europe and Japan. Eventually, however, the purchase of foreign technology, in terms of whole plant and machinery imports, was interrupted by the onset of the Cultural Revolution, an event that culminated in China's adoption of radical autarkic policies until the early 1970s.[a]

From the perspective of foreign borrowing, the Cultural Revolution (CR) represented an all-out attack on the acquisition of foreign technology. China basically closed its doors to foreign intercourse and the country went into a posture of deep insulation. The CR also brought to the surface the deep divisions that existed within China regarding the issue of technology imports, and revealed the strong hostility and chauvinism of particular political groups in China vis-a-vis the foreign technology issue. Self-sufficiency at both the local and national level was encouraged. Reliance on modern science and technology was criticized, as was the expertise of China's scientific community and economic managers. The result of the turmoil engendered by the CR was debilitating to the functioning of scientific institutions and the development of the Chinese economy.

The early 1970s witnessed a sharp reversal of the policies advocated during the height of the Cultural Revolution. Between 1972–77, China embarked on a major campaign to purchase whole plants and equipment from abroad. The State Council approved a budget of $4.3 billion for the program—as a result the program became known as the "four-three" scheme.[9] Over US$3 billion in plant purchases were made during this period. Most of the acquisitions were aimed at meeting basic needs in such fields as clothing and food by increasing production of chemical fertilizers, petrochemicals, and light industry products. Approximately 51% of the foreign exchange alloted for the "four-three" program went to purchasing items for end-users in the above industries. The metallurgy and energy industries each received a 20% share. Over 30 projects were begun, with most of the technology involved having the following characteristics: "high capital intensity, large scale, high efficiency, automated control, and intensive use of thermal energy."

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[a] Ibid.

It was during this period that China purchased 8 ammonia plants for chemical fertilizer production from Pullman Kellogg of the United States and 8 urea plants from the firm's European subsidiary, Kellogg Continental. The Chinese also revised their earlier policies and decided to allow a substantial number of foreign technicians to enter China in order to assist with the construction of foreign plants and the set-up of machinery and equipment. Over 3000 foreign technicians and engineers visited China to assist with the transfer of technology. In the Kellogg case, for example, approximately 150 technicians were in China at one time or another providing leadership and guidance with respect to the overall construction of the plants. In point of fact, the Kellogg technicians did not only oversee construction of the plants, but were also responsible for basic design, engineering, procurement, and commissioning of the fertilizer plants.[10]

Indications are, however, that approximately two-thirds of the total imported plants experienced considerable problems, some during construction and others during the testing stage and initial start-up. These problems were recently spelled out in the April 1981 issue of Economic Management, a Chinese journal designed to provide enterprise managers with new information about modern management techniques.[11] These problems included the following:

(a) "Delays in construction and operations." By the end of 1977, 11 of the 24 projects scheduled for completion by the end of the year were delayed for 12 months or more. The Sichuan Changshou Vinyl Plant, for example, experienced a three year delay.

(b) "The majority of the plants have frequently been operating under capacity." Of the 17 plants finished before 1978, nine were operating at an acceptable energy efficiency/output ratio of 90 percent, including seven of the large chemical fertilizer plants. The other plants, including the Yanshan Petrochemical Plant (76 percent), the ethylene chloride plant at the Beijing Second Chemical Industry (65 percent), and the Wuhan Iron and Steel Mill (50 percent) were all operating at significantly lower rates. Four of the synthetic ammonia plants (Guizhou, Guangzhou, Nanjing, and Anqing) were also operating at the 50 percent level.

(c) "The return on investment for purchase of the plants have been poor." Only 25 percent of the projects have produced an acceptable rate of return since their completion. Several of the petrochemical plants, for example, have only returned 70 percent of their total investment even though many began operating in 1976–77. The Wuhan Iron and Steel mill project was cited as a particular example of a problem-plagued plant. Six of the 13 chemical fertilizer plants imported during the 1970s were also plagued by operating problems. The plants at Hubei and Hunan, for example, were operating at a loss due to increases in the price of light oil. The chemical fibers projects in Sichuan and Liaoning were unable to start-up at the projected time due to difficulties with peripheral design, equipment quality, and management, resulting in a $3 billion yuan loss in state revenues. The start up of the Sichuan Vinyl Plant noted above was delayed because of lack of supply of natural gas immediately after the plant's completion.

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[9] Jingji Guanli (Economic Management), Apr. 15, 1981.

[10] Nitrogen, September/October 1974, pp. 24–52 New York Times, October 26, 1976, p. L 51.

[11] Jingji Guanli, Apr. 15, 1981.

(d) "Duplication of equipment and technology imports." This was a major problem due to lack of communication and coordination within the Chinese bureaucracy. Between 1972 and 1979, 252 duplicate sets of equipment covering 17 categories of items were imported. Moreover indications are that most of these items could have been produced domestically. As a result a large number of domestic producers of machinery and equipment were left with idle capacity.

Although whole plant purchases had risen to almost US$1.3 billion by 1973, they began to decline steadily; the total value of plant purchases sank to US$185 million and US$59 million by 1976 and 1977 respectively. One of the major reasons for the curtailment of the plant imports was financial. Rising inflation in the world market as a result of the OPEC oil price rise impacted in a negative fashion on the Chinese economy. This problem, combined with growing domestic economic problems, imposed serious financial constraints on China's ability to pay for additional plants and equipment. The other major reason for the halt in imports was political. Starting in 1974, political criticism against extensive technology and plant imports began to grow. The "politicization" of the issue by the Gang of Four and their supporters made it difficult for proponents of large technology imports to continue with the "four-three" program.

The Chinese experience during 1972–77 indicates that the country's technical capacity for assimilating foreign technology was inadequate and that the domestic mechanisms for allocating plant inputs were not sufficiently developed to ensure efficient plant construction and operation. The Cultural Revolution had clearly disrupted the operation of the Chinese economy. Persons with strong political credentials rather than technical capabilities were placed in key administrative posts. These persons were not capable of handling the complex tasks involved in the assimilation of foreign technology or managing the operation of large, complex plants such as those that are common within the petrochemical industry. As the author of the Economic Management article suggests, "the lessons of the 'four-three' scheme were not seriously summed up in order to draw experiences and learn lessons from it," and as a result, the country was ill-prepared to bring these plants on line, as well as to handle the next wave of whole plants and technology imports.[12] Some learning and diffusion of foreign technology, however, did occur. For example, the development of the Shanghai petrochemicals complex owed much to the transferred technology embodied within several of the whole plant imports during this period.[13] Generally speaking, however, while many of the imported plants, such as those providing increased inputs for the manufacture of chemical fertilizers, were able to contribute to the expansion of production, the embodied technology within these plants was not easily dissected or diffused.

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[12] Ibid.

[13] JPRS 77269, Jan. 28, 1981, pp. 58–62. Beijing Review, Dec. 8, 1978, pp. 10–12. Chemical & Engineering News, Dec. 17, 1979, pp. 21–30.

D. CHINA'S FOUR MODERNIZATIONS PROGRAM AND TECHNOLOGY IMPORTS

The announcement of the "four modernizations" program in February 1978 marked the beginning of a new thrust in China's economic policies. The four modernizations was conceived as a multi-faceted program designed to enhance China's national security, promote long-term self-reliance, and bring China's technological and defense capabilities to world levels by the year 2000.[14] The program gained momentum in late 1976 after the death of Chairman Mao and the arrest of the radical Gang of Four. It was not until early 1978, however, that the Chinese leadership was able to develop a comprehensive plan to spearhead the modernization effort.

The objectives of the program, as stated by the Chinese, were to expand the quantity and upgrade the quality of production in agriculture, industry, national defense, and science and technology. In February 1978, a set of modernization goals were spelled out, including construction of 120 large-scale industrial projects and ambitious production targets for steel and agriculture. Recognizing the backwardness of their industrial and S&T base, the Chinese indicated a greater willingness to import foreign technologies and to use these technologies as a means to spearhead domestic S&T development. Reform of the existing system of management and decision-making in industry, education and research was also stated as a vital component of the modernization program. Without such a comprehensive modernization effort, proponents of the program argued that China would remain weak and vulnerable.

China's eagerness to achieve the goals set out in the modernization program resulted in the sending of large numbers of Chinese scientific and economic delegations overseas to explore for and examine the state-of-the-art civilian and military technologies available within the West. The sending of these delegations abroad began as early as 1976, though their numbers peaked in 1978. As a result of their extensive travels or what some Western observers have described as "a giant Chinese shopping spree and fishing expedition," the Chinese were able to garner substantial amounts of technical information in fields of relevance to both civilian and defense modernization. By the end of 1978, China had negotiated or signed contracts (many of which were only agreements-in-principle) for plants and equipment in excess of US$ 7 billion. Discussions continued, however, for additional civilian and military technology purchases amounting to US $30–35 billion.[15] Technology and whole plant purchases for modernizing petrochemicals and metallurgy accounted for the largest part of Chinese expenditures. (See Table 1) Among the major projects were a large integrated steel mill at Baoshan (technology from Japan, Germany and the US) and petrochemicals complexes in Nanjing, Shengli, and Beijing (technology from Japan, UK, Germany, and the US). In order to pay for most of these purchases, the Chinese hoped to significantly expand their output of petroleum so that large quantities could be exported to earn foreign exchange.

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[14] Richard Baum. "China's Four Modernizations." Boulder. Westview Press. 1980.

[15] National Foreign Assessment Center. "China: Post-Mao Search for Civilian Industrial Technology (ER 79-100204), February 1979.

TABLE 1.—CONTRACTS FOR WHOLE PLANT, BY INDUSTRY

[In millions of dollars]

	1972	1973	1974	1975	1976	1977	1978	1979
Petrochemicals	0	698	114	90	136	39	3,325	29
Iron and steel	0	0	551	0	40	0	2,978	312
Fertilizer	0	392	120	0	8	0	0	15
Coal and electric power	23	161	46	0	0	0	202	736
Transport	0	0	0	200	0	0	79	66
Communication and electronics	0	0	0	0	0	0	217	125
Nonferrous metals	0	0	0	0	0	0	127	3
Manufacturing	0	8	0	74	1	21	6	279
Petroleum and gas	0	0	0	0	0	20	0	31
Other[1]	35	0	0	0	0	1	0	110
Total	58	1,259	831	364	185	81	6,934	1,706

[1] Includes cement plants, hotel and office buildings, and caustic soda plant.

Sources CIA, "China: International Trade Quarterly Review Fourth Quarter, 1979," (Washington, D.C., 1980); CIA, "International Trade Handbooks (Washington, D.C., 1975–80); CIA, "China: Post-Mao Search for Civilian Industrial Technology" (Washington, D.C. 1979).

By December 1978, China's leaders realized that their original goals for modernization were overly ambitious, that the details for implementing the program had been obscure, and that the priorities for allocating scarce financial and technical resources were loosely defined, at best. Although China had begun extensive purchase of foreign technology and equipment, domestic economic and financial limitations and a lack of qualified technical personnel became critical constraints on its ability to make effective use of this newly acquired technology. Poor coordination within the Chinese bureaucracy also hindered the success of the four modernizations. One Chinese source, for example, suggests that machinery and computer purchases were often arranged in spite of the fact that similar items were already available in nearby areas and were in many cases being underutilized.[16] Additionally, many organizations had signed agreements with foreign firms without a commitment of money from the central authorities or without having the authority themselves to enter into such agreements. The severity of most of these problems was brought into sharper focus at the Third Plenum held in December 1978 at which time a major reformulation of China's basic modernization strategy was initiated.[17]

As a result of the decisions made at the Third Plenum, China's priorities shifted away from the concentration on heavy industry that had dominated the initial phase of the program. The theme of "readjustment, reform, consolidation and improvement" became the new focal point of China's modernization strategy. New emphasis was placed upon the development of light industry, agriculture, and energy. Decentralized controls were advocated as part of the effort to reform the economic structure and to stimulate local initiative by granting greater decisionmaking autonomy to individual enterprises and lower administrative units in such areas as foreign trade. Many domestically-generated projects were scaled down. Restrictions were placed upon additional capital construction, resulting in the cancellation or suspension of several major industrial projects containing foreign participation in early 1979, including the highly-touted Baoshan steel mill project. Economic cutbacks, technical considerations, and inadequate feedstocks and raw material inputs were cited as the main reasons for the cancellations. In a large number of cases, such as the Baoshan steel mill project, adequate feasibility studies regarding the technical and economic viability of particular projects had not been conducted beforehand—the result being that construction could not be completed or plant operations could not begin upon completion.[18]

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[16] Beijing Ribao, Dec. 15, 1980, p. 41.

[17] National Foreign Assessment Center. "China: The Continuing Search for a Modernization Strategy" (ER 80–10248), April 1980.

During 1979, the program of economic readjustment was progressing slowly. There was resistance to many of the changes instituted at the Third Plenum, as well as a variety of other bottlenecks that were preventing readjustment from being fully implemented. The imperatives of readjustment were in conflict with many of the ongoing efforts associated with economic reform. Centralized controls were gradually reimposed in order to ensure compliance of local level units with the economic priorities being articulated at the national level. Bureaucratic infighting among various ministries was also a source of resistance, one that manifested itself in the inability of the central authorities to arrive at decisions regarding the disposition of various projects. Many ministries, particularly in the heavy industry sectors, felt threatened by the changes contained within the readjustment program.

Efforts were made throughout 1980 as well to remedy many of the imbalances in the Chinese economy, including the implementation of a program of national energy conservation, the consolidation of small enterprises, and the imposition of stringent financial controls. The readjustment program, however, continued to follow an uneven pace—one that was clearly much slower than the central leadership in Beijing had originally anticipated. Although in mid-1979 the Chinese leadership had decided to re-start some of the projects suspended during the initial phase of readjustment, many were subsequently cancelled again in early 1981, including a large portion of the Baoshan steel mill and several of the petrochemicals projects. Estimates suggest that a total of 22 projects worth approximately US $2.7 billion were either cancelled or postponed. Firms from Japan and West Germany were the hardest hit by the Chinese decision to unilaterally halt construction.[19] In some cases, a large percentage of the machinery and equipment contained in the projects had already been delivered. Foreign firms wanted to be compensated for both real and potential costs resulting from the Chinese actions, including the rendering of technical services and consultations, but were not able to work out an acceptable agreement with the Chinese.[20]

Policies in force in mid-1981 were aimed at continued reductions of capital construction, improvements in plant efficiency, and the placing of more technically competent persons in positions of authority within the economic and S&T systems. The issue of compensation for the cancelled plants remains unresolved, though negotiations between the Chinese and the concerned foreign firms are continuing. In some cases, the Chinese have indicated a desire to continue forward with some of the plants, e.g. petrochemicals, and have been trying to secure loans and other financing to allow the projects to go forward. They have also exhibited a greater willingness to enter into joint venture (equity & non-equity) and compensation trade agreements as a means to secure needed technology and equipment for projects in areas of current high priority.

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[18] See article by Martin Weil in this volume.
[19] China Trade Report, May 1981.
[20] China Business Review, May/June 1981.

E. SCIENCE POLICY AND THE PROBLEM OF UTILIZING TECHNOLOGY

China's decision to initiate a program of economic readjustment resulted in several important changes in its strategy and objectives for acquiring foreign technology. These changes, however, also derive from some of the fundamental revisions of the 1978 national science plan that have been introduced since the Third Plenum. From both the pronouncements in the open Chinese press and the observations of Western industrial and scientific experts who have visited China, it is readily apparent that many of the country's S&T policies were ill-suited to meeting the immediate needs of the modernization program and were seemingly inappropriate from the standpoint of the existing scarcity of qualified personnel, modern equipment and facilities, and available funding.

The holding of a national science conference in March 1978 signified the importance that the regime attached to science and technology.[21] The comprehensive program announced at that meeting represented an important step in China's efforts to improve the operation and performance of domestic S. & T. institutions. A set of priority areas were spelled out. In some cases, the choice of priorities reflected the attempt to address some of the critical bottlenecks to the success of the modernization drive, e.g., computers and energy. In many cases, however, the choice of fields and projects was done with the hope of reintegrating Chinese scientists with the Western scientific community and encouraging research that would help move China into the forefront of world scientific and technological advance. This latter goal was particularly important to China's leading scientists for two reasons: (1) their almost continuous isolation from Western science since 1949 and (2) their desire to establish their own credibility within the Chinese system by achieving recognition on the world level.

Chinese assessments of their own weaknesses have been and continue to be frank and quite accurate.[22] Many of the problems within China's S. & T. system owe their existence to the continuing legacy of the Cultural Revolution and the reign of the Gang of Four (1966–76). For example, the severe shortage of qualified technical personnel and the backwardness of domestic S. & T. capabilities derived, in many respects, from the closing of Chinese universities and research institutes during what many have come to call "the lost decade." This lack of qualified S. & T. personnel was the main impetus behind China's decision in the late 1970s to send large number of students and researchers overseas for advanced training.

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[21] FBIS–PRC, March 29, 1978. Beijing Review, March 24, 1978, pp. 3, 9–18. Beijing Review, April 7, 1978, pp. 3–17.

[22] Richard P. Suttmeier, "Science, Technology and China's Drive for Modernization," Stanford Hoover Institution Press, 1980.

Another group of problems was more deeply rooted in the structure of the S. & T. system itself. Perhaps the two most outstanding characteristics of the S. & T. system were its over-centralization of authority and the weak links between research and production units. In spite of the common impression in the West that Chinese science and technology have been "applications" oriented, the reality of the Chinese situation is that the research system is highly compartmentalized. Communications between the researcher and the product end-user have been uneven and irregular at best. In some ways, the source of the problem is manifested in China's reliance on the Soviet-type model of organization, one where potential end-users have had little incentive to adopt innovations and move beyond the major goal of output maximization. Market-type pressures for stimulating the development of links between the scientist and the factory have been limited.

The various aspects of the S. & T. modernization plan were aimed at addressing many of these problems. The revival of the State Science and Technology Commission, for instance, was designed to insure more coherent S. & T. planning and improve coordination among the various elements in the S. & T. system. Budgets for research were expanded. Organizations such as the "scientific societies" were allowed to reemerge so as to facilitate contacts between S. & T. personnel. A comprehensive system for disseminating scientific and technical information was constructed, and several new journals were established in order to popularize information about foreign technology and domestic advances. All of these efforts were designed to help China catch up with the West by speeding up the pace of S. & T. modernization.[23] From the perspective of their actual impact, however, they did more to construct linkages between China's S. & T. community and the external environment than to strengthen the operation of indigenous institutions in support of national development.

The decisions announced at the Third Plenum forced China's S. & T. community to reexamine many of its plans and programs for S. & T. development. China's initial goal of modernizing the complete spectrum of Chinese science and technology capabilities was replaced with a less ambitious, more practical set of goals, most of which stressed applied research and technology development.[24] Most important was the growing realization that the emphasis placed on science and technology since the mid-1970s had not produced the desired economic results. As one commentator suggested, the use of science and technology was done "with a high degree of blindness." The severity of the problems with China's pre-readjustment S. & T. policies were spelled out in an editorial in the Liberation Daily out of Shanghai in June 1981:[25]

> (1) "Paying no heed to the national condition, blindly catching up and overtaking, and actually engaging in "world science." In an effort to modernize S. & T. capabilities, too much emphasis was placed on making quantum leaps and basic research without considering the existing constraints on S. & T.-related resources.
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> (2) "Failing to act according to scientific laws, neglecting the role of experts, and actually pursuing scientific research of the whole people." Among the key problems cited was the proliferation of research institutes throughout the country—in one province the number of new institutes grew by 153 percent. Many of these so-called institutes have been dubbed the "three no centers"—no research

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[23] Jon Sigurdson, "Technology and Science in the People's Republic of China," New York, Pergamon Press, 1980.

[24] FBIS–PRC, Apr. 21, 1981, K19–22; FBIS–PRC, Jan. 13, 1981, L14–15.

[25] FBISPRC, June 11, 1981, K8–12.

subjects, no funds, and no personnel. Others have been dubbed the "three diminutive centers"—one room, one seal, and one empty shelf. Others have been called the "three machine centers"—one mimeograph, one stapler, and one telephone.

(3) "Only bothering about scientific research, failing to stress economic effect, and neglecting research in production technology." According to the author, only 10 percent of all research can be translated into production-related uses. Even in the highest caliber research institutes, the rate is still only 30–40 percent. There is too much emphasis on producing prototypes and developing one-of-a-kind products for exhibitions but little concentration on actual technology development.

(4) "Impatience for success, launching projects blindly and violating scientific research order." According to one survey, out of 749 new products developed in Shanghai electrical and mechanical machinery plants, only 18 percent were reviewed prior to their manufacture for technical feasibility or performance criteria. Insufficient time is given to gathering information before a product is made in order to ensure that it reflects available technical capabilities within or outside China.

(5) "There is a vast duplication of research projects resulting in significant amounts of waste." Within Shanghai, for example, research units were carrying out duplicate research in 24 out of 53 projects begun between 1973–74 and in 28 out of 63 projects begun between 1978–79.

All of these "internal use" problems, in one way or another, had their equivalents in the objectives and policies used for acquiring and applying foreign technology. The main criticism focused on the attitudes and perceptions of China's S. & T. personnel to the relationship between sicence and technology modernization on the one hand and economic modernization on the other hand. In many respects, the issue facing China's leadership had shifted from the traditional one of "Mr. Science versus Mr. Democracy" to "Mr. Science versus Mr. Economics." The problem was described in the following way:

> At the present time, the most prominent problem about our country's policies concerning technology is that the internal relationship between technology and the economy is severed. and people pay attention to whether technology is advanced but pay little attention to whether technology is economically rational and whether the effects are harmful.[26]

Large amounts of advaned equipment and technology were imported during the initial phase of modernization without paying adequate attention to the ability of the end-user to "digest" the technology or to make efficient cost-effective use of the equipment.[27] In the future, according to the author, the appropriate aim of S&T policy and import practices should be as follows:

The evaluation of economic rationality is not only the basic aim of formulating policies concerning technology, but is also an objective requirement of national economic development. . . . The basic aim of technology should be economic results.[28]

F. CHINA'S CURRENT TECHNOLOGY IMPORT POLICIES AND PRIORITIES

Reassessment of policies regarding the importation of foreign technology led to the announcement of nine major points to follow when acquiring technology. These nine points were spelled out in Chi Shih Nien Tai in February 1979: [29]

(1) Do not import any plants or equipment that can be produced domestically. If the quality of the domestic items is lacking, improve them.

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[26] Jingji Yanjiu (Economic Research), November 1980, pp. 33–37.
[27] Jingji Yanjiu, November 1980.
[27] FBIS–PRC, Apr. 14, 1981, K6–8.
[29] FBIS–PRC, Feb. 27, 1979, N5.

(2) In those fields where items have already been purchased from abroad, no further items should be acquired if they can be produced domestically.

(3) Do not buy complete plants if they can be manufactured domestically, or if a sizable percentage of the components is available within China.

(4) When buying a specific set of equipment or machinery, the sourcing of components and other items should not be diversified if this will produce incompatibility among the various elements.

(5) Foreign specialists should be employed when necessary to ensure successful assimilation of the imported technology.

(6) Foreign consulting firms should be used to propose projects, as well as to assist with technical feasibility studies for particular projects.

(7) Avoid duplication of purchases. Improve communication among importers of technology and equipment.

(8) Within China, teams of scientists, economists, and engineers should be set up to analyze proposals regarding the import of foreign technology and equipment.

(9) Attempts must be made to standardize Chinese components so that missing, broken, or inferior parts in imported plants and equipment can be replaced by domestic suppliers when necessary.

The use of these guidelines reflected China's increased awareness of the need to more closely scrutinize its technology purchases and to ensure that if and when a purchase is made, it is successfully assimilated and becomes a productive element in China's economic structure.

Most important among the changes engendered as a result of the reassessment of foreign technology acquisition practices has been the deemphasis of whole plant purchases.[30] One of the reasons for the move away from plant purchases is financial—the Chinese remain reluctant to incur high levels of external debt at present commercial loan rates. Related to this are domestic financial considerations, particularly rising inflation and an over-extended budget. Additionally, in order to reduce capital construction, the import of large plants from abroad had to be curtailed. Even so, during the period of readjustment, attempts have been made to bypass the controls on capital construction by importing large plants from abroad under the guise of "technology acquisition." [31]

The real key, however, to the retreat from whole plant purchases has been the limited benefits in terms of technology transfer. This problem derives, in part, from the indivisibility of the technology contained within these plants, i.e., the organization and equipment within these plants have been fully integrated into a working system by the engineering architects of the plant. It is very difficult to separate out particular components, copy them, and economically employ them within a different production system. The technical and economic disutility of pursuing this line of action in the past has been noted in the Chinese press on several occasions. A Beijing Review editorial pointed out that too much attention has been paid to acquiring "eggs" and not enough emphasis has been placed on securing "hens"—the implication being that very little technical "know-how" had actually been obtained.[32] One Chinese source has suggested that only 2 percent of the total funds spent on technology-related imports during 1978 went for purchasing "technology," rather than whole plants or equipment.[33] Below, for example, is a typical criticism:

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[30] Beijing Review, July 27, 1980. FBIS–PRC, Oct. 10, 1980, L22.

[31] FBIS–PRC, Apr. 20, 1981, K11–17.

[32] Beijing Review, Dec. 8, 1978, pp. 13–16; Beijing Review, July 27, 1979, pp. 9–18; Beijing Review, Apr. 6, 1979, p. 3.

[33] Jingji Guanli, Apr. 15, 1981.

> We simply interpreted importing technology as importing equipment and mainly imported complete sets of equipment, accounting for more than 90 percent of total import spending. However, very little was truly spent on importing technology. Some of the projects were started hastily and could not be completed for a long period of time, thus the economic effects were very poor; there was nobody to look after some projects, and equipment costing thousands and millions of yuan was left idle in warehouses or the wilderness, or left to the strong winds and heavy rain, thus rotting and rusting. This was sheer waste of people's sweat and toil.[84]

The leadership's new position was even more starkly presented in an article in Jingji Guanli (Economic Management) in mid-April 1981:

> In recent years, production departments have put aside scientific studies, design and manufacturing of equipment and have enthusiastically imported complete sets of equipment. As a result, they are limited to importing one set of production equipment which has advanced technology, and this cannot effectively speed up the country's technological base.[85]

According to Chinese official pronouncements, all future technology imports are to be aimed not at equipment or whole plant purchases, but at acquiring "technology and know-how"—and making sure that these purchases can be well integrated within China's industrial structure.

> We cannot import modernization. The purpose of actively importing advanced foreign technology and equipment is to strengthen our own manufacturing power.[86]

The second major change in China's technology import policies is the new emphasis being placed upon the rehabilitation and renovation of existing enterprises. The importance of this task was discussed in the March 1981 issue of Jingji Guanli:

> Do a good job in the renewal of equipment and transformation of technology. The equipment and technical skills of existing enterprises differ from enterprise to enterprise. Production will increase by a wide margin on the present foundation as long as we carry out technical renovation step-by-step in a planned way according to different cases. All trades and professions should give top priority to technical transformation of enterprises, strengthen the study and trial manufacturing of new products and facilitate the renewal and replacement of products. . . . the policy of introducing technology and equipment from abroad needs to be readjusted properly, thus importing fewer complete sets of equipment but more indispensable technology and software in order to satisfy the needs of enterprise technical renovation.[87]

During the past several years, there has been a tendency among both economic and S. & T. types to import new whole plants rather than spend time and effort to modernize existing facilities. Additionally, sophisticated equipment and machinery were, at times, acquired from abroad and set-up indiscriminately without attempting to "fit" the items into the existing framework of production. Large-scale computers were imported from abroad only to sit idle because the potential end-users lacked the skills to operate them, did not know how to maintain them, or were unable to repair them once they had broken down. Because of these difficulties, some of the imported equipment was never installed or unpacked.

In many cases, the main cause of difficulty was the fact that most of the factories involved in the acquisition of foreign technology were actually ill-equipped to make effective use of the imported know-how and equipment. According to a March 1981 People's Daily commentary, "improper choice of factories was a major cause of previous 'indigestion' in certain technology imports."

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[84] JPRS 76338, Sept. 2, 1980.
[85] Jingji Guanli, Apr. 15, 1981.
[86] FBIS–PRC, Oct. 10, 1980, L22.
[87] Jingji Guanli, Mar. 15, 1981, pp. 3–5; JPRS 78044, May 11, 1981.

> In importing technology, we must first select the best factories for using it, that is, those factories with relatively good production conditions and relatively high standards of technology and organizational management, that have the capacity to absorb and digest advanced technology. Factories with weak technical forces, low standards of technology and chaotic management, that cannot carry out production in a normal way, cannot be designated as units for accepting imported advanced technology.[38]

Rehabilitation and renovation of existing facilities therefore will not only be directed at enhancing productivity, but will also be designed to strengthen the ability of these facilities to "digest" foreign technology.

China's acquisition of technology in the future will aim at complementing existing capabilities and greater stress will be given to choosing "applicable technologies"—which according to one commentator are those technologies that are more in accord with China's particular mix of factor endowments. This does not merely mean expanding the use of labor-intensive technologies, but refers to the raising of labor productivity through more economically rational technology choices. In the machine-building industry, for example, labor productivity (measured in output per worker) is seven-to-eight times less than that of the advanced nations. Additionally, increased emphasis will be placed on the horizontal transfer of technology, i.e., the application of the same general technologies in different fields.[39]

Efforts are also underway to secure technologies and equipment that are less-energy intensive. The Chinese have suggested that on a national basis, over 20 percent of total industrial/agricultural output is lost because of insufficient energy resources. In the case of imported plants, the problem is also severe. Chinese industrial plants tend to be also plagued with problems of energy inefficiency. The national energy efficiency rate within China's industrial sector is approximately 28 percent—which is between ½ to ⅓ the rates within US industry.[40] Similar capacity Chinese steel plants, in particular, tend to have significantly lower rates of energy efficiency than their Western-designed counterparts.[41] Ongoing efforts will be made to learn conservation methods from foreign imported plants.

> To grasp the technical transformation of enterprises, it is necessary, first of all, to carry out technical transformation aimed at saving energy, renovate the industrial equipment and produce products which do not consume a vast amount of energy with low efficiency and try hard to improve the utilization rate of our energy.[42]

The Chinese have also experienced problems, mostly technical, with maintaining and increasing petroleum production.[43] One of the major reasons for the cancellation or suspension of a large number of imported petrochemicals plants was the lack of available petroleum-based feedstocks to supply the newly imported facilities. As a result of the new emphasis on promoting the development of agriculture and light industry, future technology imports should have lower energy requirements than in the past.

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[38] FBIS–PRC, Apr. 14, 1981, K6.
[39] JPRS 76089, July 22, 1980, pp. 46–50.
[40] FBIS–PRC, Sept. 30, 1980, L24.
[41] JPRS 75978, July 2, 1980, pp. 61–69.
[42] JPRS 78044, May 11, 1981, p. 9.
[43] Oil and Gas Journal, May 25, 1981, pp. 120–122.

The fourth major modification of technology import policies is designed to move China away from the purchase of only advanced state-of-the-art technologies. This was very clearly stated by Liu Lixin, Vice-President of the People's Construction Bank of China in August 1980:

> We do not need to import the most advanced equipment and technology for every single economic department and every single production link. We should introduce more practical technology which needs less investment, absorbs more labor force and accumulates more funds for the state. We must avoid seeking a high level of automation blindly and indiscriminately.[44]

The main stimulus behind this part of the program has been the increased realization among many of China's economic planners and technical personnel that the mere acquisition of advanced technology is not the main answer to overcoming China's technological backwardness. Additional stress will be placed upon improving research and economic management, a problem area which continues to be a major constraint on technology assimilation, as well as plant operation. Although there still is some apprehension and political opposition to acquiring large quantities of foreign technology and equipment, the real task facing the Chinese is no longer whether or not to import foreign technology and to borrow from the West—the real issue is how to manage the flow of technology to meet the needs of the modernization program.[45]

As a result of this new orientation, major efforts are being made to provide market-type incentives to guide the behavior of Chinese factory managers. These efforts are designed to foster the use of "economic" criterion rather than "output" criterion as the basis of technology import decisions.

The fifth important modification of technology import policies is that they will once again be closely monitored by the central authorities.[46] During the initial phase of the modernization program, decentralized decision-making had allowed for direct negotiations between enterprises or provincial trading companies and foreign firms, thus reducing the control of the central authorities, such as the Ministry of Foreign Trade, over trade-related and technology import-related matters. Overspending and duplication were common problems. Currently, China's Import-Export Control Commission, as well as several other organizations ranging as high as the State Council, will now review all large purchases from abroad. In addition, strict controls have been placed on the allocation of foreign exchange spending by the Bank of China, and, as a result, all large purchases will be reviewed by central economic officials. While lower level administrative and productive units will have some authority to make small purchases, they must defer to the center when contract amounts reach beyond a set amount. These actions are all aimed at ensuring that purchases are preceded by adequate studies for economic feasibility and comprehensive assessments for technical viability.

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[44] Beijing Review, Aug. 25, 1980.
[45] JPRS 78312, June 17, 1981.
[46] China's Foreign Trade, January/February 1981, pp. 2-5. FBIS-PRC, Dec. 8, 1980.

Future Chinese technology imports will tend to be dominated by purchases in three main fields: agriculture, light industry, and energy. The production of consumer products within China and for export is being stressed. As a result, the Chinese will aim to acquire technologies that can improve production capabilities within these sectors. Energy development will be the highest priority area, with special emphasis on energy conservation techniques, petroleum technology (off-shore and on-shore) and electricity transmission technologies. China will also continue to seek technology, equipment, and expert advice with respect to the development of its transportation and communications networks. Even within the capital goods industries, meeting consumer demands will be given high priority. The machinery industry, for example, will move away from supplying mainly capital goods, and will now try to assist the technical transformation of enterprises in textiles, food processing, and electronics.

China's future purchases of foreign technology will also be guided by more conservative financial practices.[47] This remains the case in spite of China's greater willingness to borrow abroad at favorable concessionary rates. According to an August 1980 article in Beijing Review, China's foreign borrowing will not exceed 20–25 percent of its total yearly foreign exchange earnings. Three additional criteria will also be applied: (1) the products turned out by the imported equipment or project must be competitive on the international market; (2) if the products cannot be exported, they must be substitutes for a product being produced domestically; or (3) the rate of profit earned by the project should be higher than the rate of interest on the borrowed money. According to Chinese calculations regarding whole imports in the 1970s, it is estimated that for every U.S. dollar spent on imported equipment, an investment of four yuan was needed to provide support equipment and inputs to make the project viable.[48] In many cases, funding to cover these local costs, the majority of which the Chinese were going to cover at the start of most of the projects, was not available. The necessary funding became even harder to secure as a domestic budget deficit began to appear. Ancillary equipment could not be provided, making it difficult, if not impossible, to operate imported plants and equipment even after their completion.

G. CHINESE APPROACHES TO ACQUIRING TECHNOLOGY

These Chinese have tended to regard the import of whole plants and equipment as an important vehicle for technology acquisitions. Since 1978, most of the funds China has expended on so-called "technology acquisition" have been for whole plant purchases. Additionally, the Chinese have also considered the purchase of foreign machinery as a form of embodied technology transfer. In a large number of cases, entire sets of machinery have been purchased as opposed to acquisition of single pieces of equipment. China's imports of machinery and equipment have been quite considerable from the perspective of overall imports—averaging as much as 20–25 percent of total imports in the 1970s. (See Table 2) Many of the models of Chinese-built machinery derive their basic designs from these imported models, especially those from the Soviet Union and Eastern Europe.[49] In recent years, their qualitative impact has been even more evident, particularly in view of the fact that much of China's on-line machinery is of 1950s vintage. Between 1975–79, a large variety of machinery was imported in order to help remedy critical gaps in Chinese technical capabilities. (Table 3) Most of this machinery was imported from the Western nations and Japan.

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[47] Beijing Review, Aug. 25, 1980.
[48] FBIS–PRC, Aug. 6, 1980, L10.

TABLE 2.—MACHINERY IMPORTS AS A PERCENTAGE OF CHINA'S TOTAL IMPORTS

Machinery imports	1975	1976	1977	1978	1979
Machinery and transport as a percent of total imports (SITC 7)	28.7	28.7	15.2	17.0	26.2
Nonelectrical machinery as a percent of total machinery imports (SITC 71)	51.6	65.3	34.8	44.4	58.4
Electrical machinery as a percent of total machinery imports (SITC 72)	11.0	17.2	10.6	13.5	16.4
Transport equipment as a percent of total machinery imports (SITC 73)	37.4	17.5	54.6	42.1	25.2
Precision instruments as a percent of total machinery imports (SITC 861)	2.4	2.6	3.9	3.7	4.3

TABLE 3.—CHINA'S MACHINERY IMPORTS, 1975–79

[In millions of U.S. dollars]

Type of machinery	1975	1976	1977	1978	1979
Power generating [1]	107.17	105.15	23.79	47.10	63.13
Electricity transmission	23.38	19.04	2.20	12.70	7.20
Agricultural	14.68	.51	3.57	28.20	24.00
Metalworking [2]	116.77	281.82	48.24	88.50	140.95
Textiles	24.97	12.51	6.37	10.39	92.91
Construction	31.45	16.21	20.14	108.57	413.63
Mechanical handling	52.31	29.28	7.37	24.71	188.79
Electrical power	75.53	86.48	20.64	43.34	48.68
Transport [3]	605.02	217.93	430.65	546.95	716.11
Ball and roller bearing	27.40	11.53	9.89	21.90	15.69
Precision instruments	38.23	32.63	30.49	49.57	121.89
Electricity measuring and controlling	27.77	18.42	21.00	49.01	146.08
Total, machinery and transport	1,621.22	1,249.40	790.88	1,346.53	2,845.77

[1] Not including aircraft engines.
[2] Includes welding and casting equipment.
[3] Includes railway, motor vehicle, aircraft, and ship equipment.

China's acquisition of modern foreign-designed machinery is important for several reasons. These imports provide Chinese producers with technical know-how and capabilities that do not already exist in the country, and are therefore a potential catalyst for stimulating technological advance. In some ways, they have helped China to become more self-sufficient in its ability to meet its own needs for certain capital goods, and have therefore resulted in decreased imports of various types of machinery and equipment. Moreover, they have helped to encourage some basic improvements in factory organization and management by virtue of end-user efforts to maximize full use of the newly acquired equipment. In general, however, imports of machinery and equipment, as well as the importation of turnkey plants, have as often been used as a means to increase productivity in a particular industry as they have been acquired for purposes of technology learning.

The Chinese have also engaged in "reverse-engineering," copying, imitating, and licensing as a means to acquire technological know-how. In addition to the gains that have been accrued within their machinery industry, China's computer and aeronautics industry have benefitted from access to foreign designs. In some cases, reverse-engineering has been a necessity. For example, Chinese development of the F–7 aircraft progressed in spite of the Soviet pullout because of the availability of a readily available Soviet model from which to work, i.e. the MIG–21F.[50] The Chinese engine used to power the plane is an exact copy of the Soviet-designed Tumansky R–11 turbojet engine. The disadvantage of acquiring "technology" through this mode is that most of of the learning that occurs is the product of "show-how" rather than "know-how." In other words, the user may be able to copy an item or to follow basic assembly instructions, but may never come to understand the essential design elements underlying the development and application of the technology. Evidence of the inherent disadvantages associated with this approach has appeared within China's machine tool industry where some Chinese copies of both Soviet and Western models have tended to operate at below the rated capacity of the original items.[51]

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[49] JPRS 76462, Sept. 27, 1980, pp. 51–58.

The case of the Y–10 aircraft is often cited as another example.[52] In this case, however, although Chinese engineers and aircraft specialists did benefit from the availability of techical data in the open literature regarding the design and construction of the Boeing 707, the Y–10 is not a copy of the 707. Although China's Y–10 does physically resemble the 707, its differences in terms of operational capability and internal instrumentation are readily apparent according to US aeronautics experts who have examined the plane. In many respects, the Y–10 project owes its development to the ability of the Chinese aeronautics establishment to combine domestic capabilities with technical data and knowledge accumulated from foreign sources. Rather than developing the Y–10 to produce an airplane for its civil aviation fleet, China's main goal appears to have been to advance its aerospace technology and manufacturing know-how.[53]

The most highly publicized example of a Chinese licensing venture has been the case of the Spey engine (RB 168–MK202)—a turbofan engine which the Chinese licensed from the Rolls Royce Corporation of Great Britain in December 1975.[54] Among the various types of equipment and technical assistance that were acquired by the Chinese in order to proceed with the project were the following:

(1) License for manufacture of 50 Spey engine knockdown assemblies from Rolls Royce (December 1975);

(2) Acquisition of equipment for measuring engine compression (March 1977);

(3) Purchase of a heat-resisting alloy welding machine (1977);

(4) Testing equipment for Spey engine (February 1978);

(5) Acquisition of forged bearing parts for the Spey engine (March 1978);

(6) Purchase of aircraft test stand for Spey engine (May 1978);

(7) Purchase of four large-size air compressors for jet engine test stand (December 1978);

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[50] JPRS 74147, Sept. 7, 1979, pp. 17–23.

[51] Yan Quishi, "It is an Urgent Task to Replace Equipment Used in the Machine Building Industry," Jingji Guanli, February 1980.

[52] Aviation Week and Space Technology, May 19, 1980, p. 32.

[53] Flight International, Aug. 2, 1980, pp. 422–424.

[54] JPRS 71307, June 16, 1978, pp. 93–97.

(8) Contract for additional technical support from Rolls Royce (August 1978);

(9) Purchase of nineteen machine tools for Spey engine component production (March 1979);

(10) Acquisition of a vacuum melting furnace for manufacturing nickel-cobalt alloy for Spey engine (August 1979);

(11) Purchase of five machines for marking the turbine and compressor blades of the Spey engine (April 1980);

(12) Purchase of roll spot welding and seam welding machine for welding nickel-chrome heat-resisting alloys (May 1980).[55]

As can be seen from the above, most of the contracts involve purchase of sophisticated machine tools and test equipment for manufacture of the Spey engine. They also involve the rendering of close-support technical assistance by Rolls Royce personnel. This last item constitutes a vital element in terms of China's ability to develop both the technical and managerial skills to modernize its aeronautics industry. Moreover, because of the broad-based nature of the technical and managerial know-how made available to the Chinese, technological spillovers into other areas of the Chinese economy (outside of the aeronautics industry) could be potentially significant.[56]

All together, the Chinese were to assemble 50 Spey engines. According to China's original intentions, these engines were to be used in a domestically-designed Chinese aircraft. Additionally, the Chinese hoped to increase their ability to produce the parts and components that went into the Spey engine. Most important, however, was the potential accumulated experience that the project offered in terms of project integration and modern manufacturing know-how. In addition to on-site training in China, over 700 Chinese technicians have received technical training at Rolls Royce in Great Britain during the course of the project. These persons, particularly those in the engineering field, will be the main "transfer agents" for diffusing the knowledge gained from the project.

As of early 1981, the Chinese had tested four of the engines, but according to Rolls Royce officials, the project had not gone as well as anticipated.[57] Although the four engines did have adequate test results, the Chinese have not been able to meet their original goals in a variety of areas. In particular, the Chinese apparently do not have an airframe within which to mount the Spey engine. Both the Chinese and British seem to agree, however, that the "learning" aspects of the project have been appreciable and that from this experience, the Chinese have developed a better appreciation for the importance of "management" in the production process.

Most recently, there has been a deliberate effort to concentrate more on the acquisition of "disembodied" technologies through greater stress on advanced training overseas and training that accompanies the purchase of a particular item or whole plant. According to current estimates, there are about 3000 government-sponsored PRC students and researchers studying in the United States. Most of these persons are enrolled in courses and research programs in the natural sciences and engineering. All together China plans to send approximately 10,000 officially sponsored students and researchers for advanced training in the West by 1985. In a recent commentary in Hongqi (Red Flag), the new emphasis in Chinese policy was spelled out:

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[55] Assorted Japanese, European, and U.S. periodicals, 1975–81.
[56] Far Eastern Economic Review, Apr. 10, 1981, pp. 24–25.
[57] Financial Times (London), Apr. 6, 1981, p. 1.

> **Imported complete sets of equipment are not as good as imported key equipment; imported key equipment is not as good as introducing technology; introducing key technology is not as good as recruiting experts and putting them into service.**

The short-term effectiveness of this mode of technology acquisition, however, is often limited by language barriers between the trainee and trainer. Additionally, in the Chinese case, poor educational background has served to hamper the training process even though Chinese technical trainees, students, and research scholars are anxious to learn and are extremely hard-working. Even if these problems can be overcome, there are problems internal to China that may also limit the potential contribution of overseas returnees. Lags in political attitudes among various strata of the administrative hierarchy and lack of modern facilities may hamper these students from making a contribution.[58] This latter problem may be especially critical in view of the fact that recent returnees have been trained within much higher quality, modern, Western scientific and technical institutions, and may not have an opportunity to put their newly acquired skills and knowledge to good use in China at the present time.

Bilateral S. & T. cooperation agreements have also become an important channel for technology acquisition, particularly in those areas where China's basic scientific and technology base is weak. China has arranged formal S. & T. cooperation agreements with all the members of the OECD group of nations. In addition, the Chinese Academy of Sciences has developed institutional agreements with its counterparts in the OECD nations, such as the National Academy of Science in the United States. These agreements provide for the exchange of students, scholars, and researchers, as well as research-related cooperation in scientific fields of interest to both parties. At times, the framework of these bilateral S. & T. agreements has been used as a vehicle for the development of commercially-based S. & T. relations between China and firms from the cooperating countries. Over the last 2½ years, S. & T. relations between China and the U.S. have grown quite rapidly as a result of the overall S. & T. agreement signed between the two countries in January 1979. Cooperative programs have been arranged in 17 different fields, including hydropower, earth sciences, and scientific management. Cooperation in the management field has resulted in the establishment of a joint U.S.–P.R.C. industrial management center in Dalian, China, where American and Chinese management experts are working with online Chinese enterprise and research managers to upgrade China's management system to better accord with the requirements of modern industrial development.

The Chinese have also made a major effort to subscribe to or secure copies of Western technical journals. Several magazines have been established in China in order to disseminate technical information that can be used for scientific advancement and technology development purposes. China's import and export companies also circulate information about the importation of any new and large instruments by any institute where foreign technicians come to install, test, and operate the equipment.[59] This type of activity has been particularly common in Beijing, but, most recently, Tianjin has also taken steps to follow a similar path. A national network for collecting and distributing foreign and domestic technical publications is also being developed. At the Shanghai Scientific and Technological Information Center, for instance, over 2 million pieces of foreign patented data have been collected.[60] All together, nearly seven million patented documents from the US, Japan, and Western Europe have been secured. As a result of its collection efforts, a study of foreign computer development trends was prepared and disseminated to pertinent organizations throughout the Shanghai area.

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[58] FBIS-PRC, Mar. 17, 1981, L7; JPRS 78147, May 22, 1981, pp. 1–5.

H. CHINA'S CAPACITY TO ASSIMILATE FOREIGN TECHNOLOGY: STRENGTHS AND WEAKNESSES

Students of Chinese economic development have paid close attention in recent years to the flow of foreign technology into China. Accordingly, there is great interest in academic, business, and government circles to determine both the real and potential impact of imported technology and equipment on China's economic progress. The extent of the impact is determined by China's capabilities to absorb foreign technology and to diffuse that technology once it is transferred from abroad. If China is to make optimal use of foreign technology (embodied or disembodied), it will have to solve a host of political, institutional, economic, managerial, and logistical problems—many of which have already negatively impacted upon the utility of previous technology transfers to China. This is particularly true in the case of defense modernization, an area where critical improvements in the technical infrastructure must be made before technology transfers from abroad will have an appreciable impact on the S. & T. modernization effort.

One of the strengths of the Chinese system for assimilating foreign technology is its capacity to mobilize large amounts of technical, financial, and personnel resources to accomplish a particular task. This capability is most often employed in the case of high priority projects, such as the Spey engine licensing project or the recent co-production agreement with McDonnell Douglas for main landing gear doors for the DC–9 aircraft.[61] Most major developments within the military sector, in general, appear to owe their existence to this mode of managing projects, e.g. ICBM development in China. The country's progress in this field owes much to the ability of defense officials to marshal the necessary scientific and technical resources in a concerted fashion to produce a Chinese ICBM capability. Extensive amounts of resources can be brought to bear on a specific project through the mechanism of centralized control—one of the few strengths of this form of management and administration in the field of science and technology. Institutes within the Academy of Sciences, for example, can be tasked by the State Science and Technology Commission to assist a particular ministerial institute with a technical problem. Most recently, military S. & T. organizations have been assigned increased responsibility for assisting civilian S. & T. organizations, particularly in those areas related to the production and improvement of consumer goods.[62] In the past, the military S. & T. system tended to be separated from the civilian sector for security reasons, and China's civilian sector did not have the benefit of the military's more extensive resources and apparently better capabilities.

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[59] JPRS 76490, Sept. 25, 1980, pp. 1–8.
[60] JPRS 74094, Aug. 28, 1979.
[61] Asian Wall Street Journal, June 23, 1980, p. 27.

Another strength of the Chinese S. & T. system for assimilating foreign technology is its experience with handling engineering-related problem-solving tasks. As a result of China's experience's with adopting Soviet technology and the country's intermittent endeavors to assume a posture of self-reliance, China has developed a cadre of versatile technical personnel capable of trouble-shooting and overcoming a variety of technical problems associated with the production process. One shortcoming of this group, however, is that it tends to be more in the mold of the "artisan-craftsman" and therefore it lacks the technical training and depth of understanding that is characteristic of its Western counterparts.

This pool of engineering-artisans has been the main source behind China's increased ability over the last three decades to produce needed machinery and equipment for the Chinese economy. Their contributions are readily apparent among firms falling into the category of "rural, small-scale industry." Practitioners of this engineering "artistry," however, have tended to fit the model of what Louis Wells has described as "engineering man" and not "economic man."[63] In the case of the former, the main goal of economic activity is output maximization. Technical innovations, if they are made at all, tend to be for purposes of maintaining or expanding output. The typical "engineering man" tends to be "effectiveness-oriented," and does not always take into consideration the factor price differentials among different production inputs. Persons falling into the latter category, i.e. "economic man," tend to be "profit-maximizers." Since the Chinese system has generally placed a low-priority on profit-type incentives, these persons have tended to bypass opportunities for introducing more efficient production technologies in favor of those technologies and modes of production that can be counted on to ensure the attainment of state-set production quotas.

In spite of these tendencies among Chinese engineers, their versatility is an important asset within China's industrial sector. A major source of this versatility is the tendency towards extensive vertical integration within Chinese production units, both large and small.[64] This tendency derives from several factors, including the political premiums that have been placed upon local self-sufficiency and the uncertainty regarding the reliability of potential sourcing partners.

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[62] Summary of World Broadcasts, FE/W1119/A/4, Feb. 4, 1981. JPRS 76925, Dec. 3, 1980.

[63] Louis Wells, "Economic Man and Engineering Man: Choice of Technology in a Low-Wage Country," Peter Timmer, et al., "The Choice of Technology in Developing Countries," Cambridge, Harvard University Press, 1975.

[64] FBIS–PRC, Apr. 23, 1981, W1–3; FBIS–PRC, Apr. 24, 1981, W8–9.

Within a single enterprise, there often exists a capability, or a capability is quickly developed, to produce the types of machinery and capital goods required to manufacture the plant's main final products.

The advantages of this "learning-by-doing" experience are appreciable, particularly in a country where there continues to be a scarcity of well-trained technical personnel. Unfortunately, there are great opportunity costs that are incurred by virtue of the duplication of effort among factories producing the same types of equipment for different purposes and the lack of specialization among production units within the same industrial sector. Administrative barriers related to differences in functional responsibilities often prevent end-users from communicating their needs to one another. Not only is there an extensive amount of duplication, but the benefits derived from economies of scale and standardization of production are frequently lost. Duplication regarding production of internal combustion engines is particularly serious—more than 20 separate ministries and commissions have set up 375 factories in almost all of China's provinces to produce these items.[65]

A third strength of the Chinese system for assimilating technology, albeit one that still remains in the development stage, is the current political climate—it is one where scientific and technical personnel are being given an increasing say in the formulation and implementation of new policies and programs.[66] Additionally, technical personnel are being encouraged to speak out against waste and inefficiency in both research programs and technology acquisition practices. This has allowed Chinese scientists and technical personnel to make frank and honest assessments of their problems and technical deficiencies. The present central leadership appears committed to preserving the integrity of the scientific process and allowing greater interaction among various sectors of the S&T community. This type of political environment, in contrast to that which existed during the 1966–76 period, is more conducive to rational allocation and selection of technology-related resources. This is not to suggest that politics has been totally disengaged from science and technology. The potential politicization of science and technology, particularly regarding borrowing from the West, is an ever present problem, and it is entirely possible that the political winds may once again change in China.

The prevailing wind, however, continues to favor foreign technology borrowing. A cautious leadership is in power, one that has come to recognize the great costs of moving too fast or putting "politics in command." Scientists, however, have not been given a free hand. Officials responsible for administering the economy and monitoring the spending of scarce investment resources are overseeing S. & T. activities through both formal and informal channels. As a consequence, future technology choices and the initiation of particular projects will come under closer scrutiny than at the onset of the "four modernizations" program. The potential danger of allowing the S. & T. community too much power and influence was made readily clear during the initial period of the modernization drive—when scientific programs and technology choices reflected more the interests

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[65] Ibid.

[66] FBIS–PRC, Feb. 6, 1981, U2.

of particular segments within the S. & T. community and less the specific needs of the economy. The readjustment program, as noted previously, was designed to remedy this tendency.

Although these factors will help contribute to the success of the S. & T. modernization program in general, they are not sufficient in themselves to ensure that the Chinese S. & T. and economic system are adequately prepared to make optimal use of foreign technology imports. The rest of this paper will be devoted to examining the major deficiencies standing in the way of more effective application of foreign technology in the Chinese production system.

(a) *Technology-related Constraints*

A severe constraint on China's ability to absorb foreign technology derives from its poor performance in translating research results into the serial production process.[67] The Chinese have frequently exhibited an ability to use foreign technical data to construct prototypes or copy foreign designs through the process of reverse-engineering. Their performance, however, tends to be uneven when an attempt is made to put these items into mass production. Lack of experience with modern manufacturing methods is one source of China's shortcomings in this area. The Chinese are frequently unable to sustain the tight scheduling and precision requirements associated with the serial production process in the West. Additionally, quality control methodologies often seem to be absent or unknown, and the application of standards varies from facility to facility.[68] In the fabrication of sophisticated electronics components, for example, there exist critical problems related to environmental purity that negatively affect the yields of the production process.

The absence of adequate testing and measurement instrumentation seems to be an important cause of Chinese difficulties.[69] Efforts are currently underway to remedy some of these problems through increased S&T cooperative programs with the advanced nations in fields such as metrology and electronics. At present, however, the type of equipment needed for improving the technical side of China's manufacturing capabilities is severely lacking.[70] As a result, particularly in such areas as the manufacture of key metal alloys, the Chinese have been unable to perform consistently with respect to meeting precise temperature and mixture requirements.[71] China has large quantities of titanium, molybdenum, and other precious metals, but lacks the technology for processing these metals into the high-purity forms required in the West.[72]

The problems noted above, however, do not merely revolve around an inability to manufacture some of the more complex and sophisticated alloys. The Chinese have successfully produced high-grade precision equipment, but the basic design engineering and processing know-how involved in the production of the items have been poor.

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[67] Asian Wall Street Journal, June 9, 1980; JPRS 78403, June 29, 1981, pp. 4–16.

[68] FBIS–PRC, Apr. 29, 1979, L8–9; JPRS 77793, Apr. 9, 1981, pp. 18–23; JPRS 75812, June 30, 1980, pp. 49–57.

[69] Yiqi Yu Weilai (Instrumentation and the Future), January 1981. JPRS 78174 May 28, 1981.

[70] JPRS 78257, June 9, 1981, pp. 24–27.

[71] JPRS 75978, July 2, 1980, pp. 66–69.

[72] Economist (London), May 2, 1981, pp. 73–74.

Major improvements will have to be made in these areas before the Chinese will be able to make effective use of imported technologies.

A related problem is the lack of automated, numerical control machinery. In some cases, this is not a severe problem because of the primacy of employment objectives. In other cases, however, use of this equipment could insure better consistency with respect to product quality, standardization of parts, and efficiency in scheduling.[73] Development of capabilities in this area will not only depend on increased technical knowledge, but also the institutionalization of a set of economic incentives that accord higher value to such considerations than was the case in the past.

In a sense, China's problems with serial production also derive from the excessive vertical integration within each Chinese production unit. As noted previously, the general pattern in the past has been for plants to become "complete" units with regard to all phases of the production process. This emphasis on "completeness" has been characteristic of both large and small units. Little stress was placed upon technical specialization. In effect, because of the priority given to meeting production quotas, individual units have felt more secure by pursuing a path of self-sufficiency. In the final analysis, however, this tendency has worked against the establishment of a set of national production standards. Interchangeability and serialization of parts and components is often non-existent. Thus, many of the technologies required to meet generalized standards, i.e. those normally associated with quality control instrumentation and precision testing equipment, never have been in high demand.

These problems have been aggravated by the fact that the composition of machinery and equipment among Chinese industrial facilities varies considerably.[74] In some cases, these contrasts are a function of the size differentials among plants within the same industry. In other cases, the problems derive from the continued use of obsolete equipment. According to an analysis conducted by the First Ministry of Machine Building, 25 percent of its production equipment dates from the 1940s, 40 percent from the 1950s, 30 percent from the 1960s, and only 5 percent from the 1970s.[75] The heterogenity of production equipment within each facility is also a source of problems. Western visitors to China have reported on numerous occasions the presence of 1940s and 1950s machinery alongside modern, 1970s vintage items. Moreover, most of the equipment is of differing origin, some having been produced in the Soviet Union or Eastern Europe, another portion manufactured within China, and an increasing amount coming from Western Europe, Japan, and recently the United States.

The underdevelopment of China's computer industry is also a critical technical constraint on the assimilation of foreign technology. China now has almost 3,000 computers on-line. Approximately 40 percent of these are tasked with data processing, 30 percent with calculation, and 30 percent with program control.[76] In contrast, the U.S. has about 54,000 general-purpose computers and 144,000 small business computers for scientific, business, and personal applications. Over 1 million more desktop and minicomputers are used for similar applications as well. In comparison with the U.S., China's inventory of computers is grossly inadequate to meet many of the computing needs of the industrial sector. The Chinese do not have sufficient numbers of computers to fulfill the requirements of the S. & T. system, much less provide "business-type" services, in such capacities as macro- and micro-economic planning, project coordination and evaluation, and equipment procurement.[77]

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[73] JPRS 76217, Aug. 13, 1980, pp. 34–42. Jingji Guanli, February 1980.
[74] JPRS 75978, July 2, 1980.
[75] JPRS 76217, Aug. 13, 1980.
[76] FBIS–PRC, Mar. 27, 1981, L13.

China has ten major manufacturing plants and several minor factories, research institutes, and universities producing computer equipment for the country. These facilities lack a high degree of assembly and testing automation. Additionally, supplies of specialized components to produce the quantity and quality of computers required for the modernization process are also limited. For example, the Chinese lag behind the West in the production of high-quality, reliable integrated circuits and semiconductor devices. This has affected their ability to develop and reproduce sophisticated military electronics items, as well as computers.[78] Poor project management in the computer industry has also been a critical problem, one that has hindered the transition from the initial stage of prototype design to the final stage of large-scale production.[79]

Rapid development of its computer industry has been a critical part of China's modernization drive. Imports of advanced computers from the U.S., Japan, and Western Europe have been an important contributor to this modernization effort.[80] Efforts have also been made to "copy" several Western-designed computers and peripheral equipment. Yet, misallocation and underultization of computers, domestically-produced and imported, have been major problems for the Chinese. According to an article in Shanghai's Jiefang Daily (Liberation Daily), although one-fourth of the computers in the city are used "relatively well," one-fourth are run with "less efficiency" and almost fifty per cent remain unused or in various stages of installation.[81] In Beijing, the most efficiently used computers are operating at over 40 percent below capacity, while a large number of computers in Beijing operate at only 20 per cent of capacity.[82]

The Chinese must develop a greater appreciation for end-user requirements, a capability that only comes with more intimate involvement in the process of computer design and construction.[83] The general approach in the past has been to focus on one-of-a-kind computer development and to downplay the importance of serialization and compatibility.[84] As a result, it has been difficult for computer users to link up with one another and form the types of computer networks that are common in the West. Moreover, the design and application of computer software has been left to the end-user, a tendency that has further worked against system compatibility and the establishment of multi-unit computer networks required for the management of China's economy.

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[77] Ibid.
[78] Aviation Week and Space Technology, Oct. 6, 1980, pp. 25–27.
[79] JPRS 75845, June 10, 1980, pp. 14–16.
[80] China Business Review, September/October 1980.
[81] Jiefang Ribao (Liberation Daily [Shanghai]), Nov. 6, 1979.
[82] JPRS 77460, Feb. 26, 1981, pp. 8–9.
[83] JPRS 76490, Sept. 25, 1980, pp. 6–7. China Newsletter (Japan), October 1980.
[84] JPRS 76490, Sept. 25, 1980, pp. 5–7.

The Chinese military currently possess the most extensive experience with developing and employing computers, such as in China's space and missile programs.[85] Due to the compartmentalization of the civilian and defense research systems, there has been little spillover from the military to the civilian sector. This may be changing as noted above. For the present, however, China's immature computer industry remains a critical bottleneck in the importation of foreign technology. For example, without improved data processing techniques, acquisition of foreign satellite-derived data will not significantly enhance China's resource survey capabilities.

(*b*) *Management and Organizational Bottlenecks*

Although the technical problems noted above will slow down China's ability to successfully assimilate foreign technology, they are greatly outweighed in importance by deficiencies in management and the project planning process. Significant amounts of waste and inefficiency have resulted from poor management and inadequate planning. The case of the Wuhan Iron and Steel Mill, a major technology import project, exemplifies the problems that China has experienced.[86]

The first section of the Wuhan steel mill was constructed with Soviet assistance in the late 1950s. In order to meet the growing needs of the economy for high-quality steel products, the Chinese decided to modernize and expand the Wuhan facility in the mid-1970s. In particular, the Chinese were interested in several of the following items: (a) low carbon steel plates; (b) ship plates; (c) high carbon steel; and (d) heavy structural steel. Lacking the domestic technology and know-how to upgrade the Wuhan mill, China decided to seek the necessary equipment and technical assistance from abroad. As a result, between 1974–75, China negotiated contracts with West Germany for purchase of a cold rolling mill and continuous casting equipment, and with the Japanese for acquisition of a hot rolling mill and silicon sheet production facility. Both contracts included provision for allowing technicians from the respective foreign firms to spend time in China to assist with technology assimilation.

From the beginning of construction, the project experienced difficulties. It took almost twice as long as expected to complete the plant and begin operation. Moreover, since operations began in 1979, the mill has been running at well below rated capacity. Several reasons exist for the problems at Wuhan, most of which relate to poor planning on the Chinese side.

During the first six months of operation in 1979, for example, a severe shortage of electric power prevented the plant from continuous operation. A survey of the available energy resources in Hubei province, site of the mill, revealed that the entire province lacked sufficient electricity to power the new plant. Electrical power had to be secured from neighboring Henan province in order to allow the Wuhan facility to operate on a regular basis.

A second problem has been an inability to fully integrate the new and old sections of the plant. As a result, production programming is often incomplete, reflecting the absence of coordination between the two sections. A third problem is air pollution. Inadequate steps were taken during the design and construction phases to handle the types of serious pollutants normally associated with large-scale steel production in other parts of the world.

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[85] American Institute of Aeronautics and Astronautics, China Space Report, New York, November 1979. JPRS 77757, Apr. 6, 1981, p. 1–4.

[86] Beijing Review, Aug. 25, 1980, pp. 26–28; Wall Street Journal, Dec. 26, 1980.

Once the mill began regular production, a fourth problem appeared—the technology and equipment within the mill were actually too advanced for Chinese needs. Some of the steel produced at the facility, e.g. wide thin steel sheets, could not be used because Chinese canning equipment dates back to the 1930s. In other cases, the mill was producing various types of steel that were in low demand among potential consumers. Even though the mill was forced to stockpile this steel, it still continued to produce many of the same items. At the same time, the steel needs of a larger number of consumers remained unmet.

A key cause of the problems at Wuhan was noted by a Chinese interpreter who worked at the mill during construction:

> The idea that modernization can be achieved by buying more plants and equipment is naive. The things bought are only means of production which can be turned into productive forces only after they have been integrated with the people who master, control, and renovate them. Modern equipment can only be considered modern productive forces when it is handled by people who are modernized.[47]

Additionally, many of the specific problems that surfaced at the Wuhan facility were typical of similar problems that the Chinese had encountered in many of their other attempts to undertake large projects involving the importation of foreign technology and equipment. These problems included the following:

(1) Inadequate planning: little attention was paid to acquiring appropriate inputs for operating the plant and for meeting consumer needs with the output of the plant.

(2) Lack of spare parts and ancillary equipment: the facility at Wuhan often had to completely shut down because of the unavailability of replacement parts.

(3) Poor management: managerial personnel at the mill were reluctant to assume fully responsibility for rectifying problems during the start-up phase and operation of the plant.

(4) Inefficient allocation of authority: technical personnel were not given enough voice in installing and putting into operation various pieces of equipment and machinery. As a result, technical decisions were often based on non-technical criteria.

(5) Lack of raw materials and energy: along with a lack of electricity, at times there was not enough iron ore supply in relation to the plant's capacity for steel production.

While some of these problems recently have been remedied, the fact remains that the delays in construction and production at Wuhan have been financially costly to the Chinese and have limited the contribution of the mill to meeting China's steel needs for the modernization program. More thorough planning beforehand might have forewarned proponents of the project about the potential difficulties ahead and have altered their decision to move ahead with construction until an adequate infrastructure was in place to support the operation of the mill at full capacity.

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[47] Ibid.

Among reasons explaining the frequent inefficiency and ineffectiveness of the Chinese planning process is the continued problem of "bureaucracy." A plant manager at the Beijing Automobile Plant spelled out the problem: ". . . those who possess authority do not possess responsibility and those who possess responsibility do not possess authority." [88] The continued pervasiveness of the bureaucratism problem was the focal point of a June 1980 Beijing Review editorial. The author listed four main causes and manifestations of the problem: continuation of attitudes favoring the maintenance of special privileges and lack of exchanges between leaders and their subordinates; lack of appreciation for the requirements of modern, large scale industry (as opposed to traditional, small-scale modes of production); reliance on ascriptive rather than universal norms for managing complex organizations, e.g., persons are still promoted according to seniority rather than competency; and economic and cultural backwardness that continue to retard the development of more efficient management techniques within economic institutions.[89]

The continued presence of the "bureaucratic mentality" among both top- and middle-level administrators can only work against improvements in the Chinese planning process.[90] Regional rivalries, competition among ministries for scarce resources, and administrative barriers between units with mutual interest in the same project compound this problem and further detract from China's ability to adequately prepare for carrying out complex projects, such as evidenced by the cases of the Wuhan and Baoshan steel mill projects.

Underlying the shortcomings within the planning process are more deep-seated problems caused by China's ineffective management system and technology. Here again, as in the case of the problem of "bureaucratism," the Chinese are aware of their problems. Within an article in the Tianjin Daily, the author made the following comments:

> The current state of affairs in our country is that management is more backward than technology. Some of our technological facilities are not at all inferior to other people's, but the products are very backward in both numbers and quality. The reason is primarily bad management. . . . To set this state of affairs right we cannot rely solely on studying and introducing advanced technology, but must train management personnel and must study and introduce modern management technology.[91]

The disadvantages resulting from adherence to a management style which emphasizes attainment of output quotas have been noted above. The situation within China's machinery supply system highlights some of the problems, particularly as they have affected the use of domestically made machnery in projects involving imported technology and equipment. According to an April 1980 article in Jingji Guanli, because production is not determined by demand, factories cannot purchase the necessary equipment they need every year.[92] There are very few channels, if any, for purchasing mechanical and electrical equipment that is not included on the official supply lists.

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[88] Beijing Ribao, May 10, 1979, p. 2.
[89] Beijing Review, June 30, 1980, pp. 26–28.
[90] JPRS 76427, Sept. 12, 1980.
[91] JPRS 76161, Aug. 5, 1980.
[92] JPRS 75978, July 1980.

Moreover, there is no reliable way of arranging production of equipment that is needed due to changes in design or the production of additional equipment that is needed because of changes in blueprints. Even when complete sets of equipment and machinery have been ordered by end-users, many of the sets have been incomplete because the producers often have no way of gauging either actual or future demand.

Many Chinese managers within both research institutes and production facilities have tended to ignore technical specifications and details and to rely upon their own experiences to accomplish particular tasks. As a result, some departments have ordered the main machinery and equipment for completing a task, but have forgotten to order the necessary auxiliary equipment. In other cases, the auxiliary equipment was ordered, but the main equipment was not. These problems derive from the fact that most enterprise managers do not have adequate technical training. For example, out of over 2,000 so-called "managerial personnel" at the Shanghai Number One Machinery and Electrical Bureau, only 16 (0.8 percent) of the managers are university or college graduates. According to another survey conducted by the Number One Machinery Department in Shanghai, factory directors with a senior middle school or university education amount to only 21.4 percent. Given the fact that Shanghai is one of China's most solid industrial areas, the situation elsewhere is likely to be even worse.[93]

Due to their lack of training, many current line managers are insufficiently sensitive to problems in such areas as marketing, maintenance, or the cost of factor inputs. They have lacked incentives to develop their professional expertise and tend to oppose competition that would reveal managerial inefficiencies. They are usually reluctant to endeavor into high-risk areas, such as those commonly associated with the R&D process and the introduction of technical innovations. Their apprehension generally derives from the political costs incurred as a result of "failures"—most of which are a normally accepted aspect of R&D in the West. Their main purpose, particularly under the changes engendered by the "four modernizations" program, has been to retain their positions in the face of the new emphasis on placing more technically competent persons in positions of authority.[94]

Within the past few months, the Chinese have been placing increased emphasis on the formation of "responsibility systems." These systems are designed to increase the accountability of both managers and workers regarding the activities that take place within their particular production units. In the past, Chinese research and factory managers have tended to lack initiative and shy away from accepting responsibility, leaving few people, if any, with a vested interest in the outcome of plant or institute activities over the course of any period of time. By decentralizing decision-making and encouraging greater acceptance of responsibility among middle and lower level managers, it is hoped that China's managers will become more flexible and responsive to particular, as opposed to general, needs.

But, decentralization of decision-making is not merely the answer to China's managerial problems. One negative consequence of the increased emphasis on lower-level autonomy has been the appearance of what one author has called "technological blockades." Because particular enterprises can now reap benefits from possession of specialized technologies, particularly those secured from abroad, they have tended to be reluctant to share their newly acquired know-how with other units. The problem has been described in the following fashion:

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[93] JPRS 77198, Jan. 19, 1981, pp. 15–28.
[94] JPRS 77198, Jan. 19, 1981, pp. 15–28.

> Technological blockades actually exist in our country. After expanding the autonomy of enterprises, competition arose, and secrecy of technological processes became an ominous matter. To gain prize money, or for reasons of competition, the inventors would often lock up an invention or the content of the new technology, and even at the appraisal meetings sponsored by higher level organs, when the substance of inventions is introduced, the inventor would refrain from divulging key points of the technology. This phenomenon of blockages is becoming a serious trend. If this trend is not corrected, it will adversely affect the development of new technologies and create a state of stagnation.[illegible]

Quite obviously, these types of blockages will further limit the diffusion of foreign technology in China and could further complicate on-going attempts to remedy the existing obstacles to increased communication among research-oriented and production-oriented organizations. In an economic system, however, where a premium is placed upon control over scarce resources, it will be hard to overcome these new hinderances in the immediate future.

The full extent of China's shortcomings in the management area were most recently spelled out in the new Chinese journal entitled Kexuexue(Scienology) in the February 1981 issue. In a discussion of the management of new product development, the authors pointed to the continued presence of the following deficiencies:

> Haphazard task assignment and evaluation: there is a lack of technical and economic substantiation. New products are developed or old ones discontinued without examining market demand or technical feasibility.
>
> Lack of an effective system of design development: coordination between research and production units in preparation of new product designs occurred in only 21.2 percent of the time in a survey conducted within Shanghai's R. & D. system.
>
> The policy of "science leading the way" has not yet been implemented: in most cases, foreign designs are merely copied and very little design and development work is actually done. This works against the development of an innovative capability with respect to the adaptation, rather than the wholesale adoption of foreign designs and products.
>
> Neglect of basic components and processes: when new products are developed, this often entails the development of new components as well. Additionally, development of new products and components usually means the development of new processes—a task that is not easily accomplished within China's production system under the present managerial and technological conditions. According to one survey of the comparative strengths and weaknesses of Western and Chinese made medium and low power diesel engines, 92 percent of the Chinese shortcomings were due to process-related deficiencies.
>
> Limited research funds and ineffective use of existing funds: the main problem is that funds are generally excessively dispersed and even when foreign know-how is imported, the recipients often have few extra funds to conduct research with respect to possible innovations.
>
> Irrational economic and evaluation policies among enterprises: in many cases, enterprises have lacked the initiative to develop new products or to secure the technology to manufacture new products. This has resulted in poor communication between the S. & T. system and the production system, as well as continued use of obsolete equipment and machinery.[illegible] Production managers have a difficult time incorporating "new" technologies into their production plans because of the irregular fashion in which new technologies are developed or made available in the Chinese system.

[illegible] JPRS 78044, May 11 1981, pp. 1–4.

[illegible] Kexuexue (Scienology), February 1981, pp. 15–20.

These managerial problems have worked against the effective assimilation of foreign technology in a similar fashion. Selection of imported technology often does not reflect actual needs and even when an "appropriate" choice is made, there is a great likelihood that the application of the new technology will not proceed smoothly. This is not to suggest that China has not benefitted from acquisition of foreign technology, but only that its performance with respect to the use of imported know-how is often uneven and unpredictable. Efforts to modernize the Chinese management system, such as the cooperative program between the U.S. and China at the Dalian Industrial Science and Technology Institute, will be slow in producing results due to the great need for rapid and sustained improvements on the one hand and the limited Chinese capacity (in terms of instructors and facilities) to train new people on the other hand.

(c) *Personnel Constraints*

Among the many constraints affecting China's ability to effectively absorb foreign technology, the personnel constraint is the most severe. Without an adequate pool of well-trained S. & T. personnel, China will continue to have problems with the transfer of technology from abroad.

According to the original goals of the modernization program, China wanted to increase the number of well-trained scientific and technical personnel from 310,000 to 800,000 by 1985. Along with sending large numbers of students and researchers abroad for advanced technical training, the Chinese embarked on a major campaign to drastically improve the functioning of higher education and to upgrade the quality of S. & T.-related training. In addition, because only a small percentage of high school graduates can attend colleges and universities (approximately 3.0 percent in 1980), efforts were also taken to expand the number of vocational schools and spare-time training programs. Among the large number of office-holders already in place in the S. & T. system, a program to re-train many of these persons was also begun. This re-training was deemed important because many of these persons had obtained their positions by virtue of their "political" rather than their technical qualifications as a result of the influence of the Cultural Revolution and the Gang of Four.

In many respects, the personnel problem is related to the advanced age of most of China's best qualified people. The majority of Chinese scientists who have received a Western education, for example, average over 60 years of age and are small in number compared to China's pressing personnel needs. Among the "younger" persons who presently staff S. & T. positions in the R. & D. system, many received their education during the 1950s in the Soviet Union. Although these people possess some technical expertise, they tend to be very narrowly focused and lack the breadth and depth of training needed to handle some of the complex tasks associated with advanced research and development activities.

A primary consequence of China's personnel problems is a lack of capable persons to fill positions at the "middle-management" level. As a result of the Cultural Revolution, almost a whole generation of young people went without a normal high school or college education.

In addition, most of China's S. & T. organizations were closed down. Almost a decade of scientific and technical advances in the West were ignored by China's leaders who were preoccupied with political, rather than technical problems. When efforts began in the early 1970s to remedy some of the damage done during the Cultural Revolution, the backwardness of China's S. & T. capabilities became readily apparent, as did the dearth of qualified S. & T. personnel to assume positions of authority. The middle-management problem became especially critical in the mid-1970s when China attempted to import a large number of Western-designed plants and sets of equipment, but lacked the personnel to "manage" the import program. Specifically, a shortage of persons with advanced engineering and project management skills was the major weakness. The subsequent decision to embark upon the ambitious technology import program associated with the "four modernizations" was thus ill-conceived from the perspective of existing personnel constraints. Although it is relatively easy to continually attribute China's current problems to the abuses associated with the Cultural Revolution and the Gang of Four, the impact of these two factors on China's national economic and S. & T. development potential cannot be underestimated.

In spite of the current emphasis on placing technically qualified persons in positions of authority, political factors have made it quite difficult for China to make widespread progress in its efforts to replace senior, incompetent, or "political" appointees in both the economic and the S. & T. systems. While appreciable changes have been made at the national level, reforms have been more difficult to implement at the local levels. Some persons, for example, refuse to relinquish their positions and continue to lag behind in terms of the new priority being given to the popularization of science and technology. They refuse to move younger, more qualified persons into key positions. Other persons, having experienced the radical reversals of the past, are still uncertain about the ultimate longevity of the current emphasis on science and technology and have yet to fully commit themselves to the new policies. An article in the May 1981 Guangming Daily described some of the problems:

> At the present time there are still some comrades within the party, including some who are in charge of economic and party and government leadership, who are insufficiently aware of the importance of science and technology and who do not support scientific and technological work. Many party committees and administrative leadership organs have still failed to put S. & T. work on their agendas, or pay lip service to its importance but actually relegate it to a secondary place so that it loses out when the pressure of work increases. Some comrades even consider that science and technology stand in the same relationship to production and the economy as the cock crow at dawn, i.e. that the dawn comes whether the cock crows or not, and that it makes no difference whether science and technology are pursued or not.[97]

Until such persons in key administrative and leadership positions can be replaced or made to understand the critical value of giving adequate attention to science and technology, absorption of foreign technology will be, at best, a difficult task.

Earlier in the paper, the ability of the central leadership to mobilize S. & T. personnel resources was alluded to as a strength of the Chinese system for harnessing imported technology. In most cases, however, indications are that personnel allocation and assignment are problem areas for the Chinese. Qualified personnel frequently are not used effectively, are mis-assigned, or are not given an amount of authority consistent with their knowledge and capabilities. At times, these problems are the result of the "politics in command" attitude that has been prevalent among many administrators. In other instances, they derive from a lack of knowledge about better alternatives for personnel assignment. They also are caused by the lack of free mobility among S. & T. personnel, i.e. there are no market forces stimulating more efficient allocation of personnel. The effectiveness, or lack of effectiveness, of the system for using China's already scarce personnel resources will determine both the ability of the economy and S. & T. system to absorb foreign technology and to diffuse that technology to other areas once it has been transferred.

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[97] JPRS 78147, May 22, 1981, pp. 1-5.

(d) *Other Constraints*

Many of the other constraints on China's ability to use foreign technology have been highlighted earlier. These include insufficient energy supplies, financial limitations, and transport bottlenecks. In some respects, these three problems are intimately related since China's initial hope was to earn foreign exchange to pay for technology imports by expanding petroleum production and increasingly petroleum exports.

The severity of China's energy problems is manifested in the uncertainty of supplies for existing enterprises and the technical bottlenecks standing in the way of increased production. Participation by foreign oil firms in off-shore exploration has provided the Chinese with vital technical assistance that will enable China to exploit proven areas much more rapidly than would have been the case if the country had decided to proceed on its own.[98] The Chinese, however, must improve their understanding of the management of such off-shore oil projects in order to reap full benefits.[99] They must also be cognizant of the growing demand for energy within their own economy, take the necessary steps to develop more energy efficient production standards, and shift to other forms of energy usage if they hope to have significant amounts of petroleum available for export.

China's attempts to increase production and expand use of other energy sources, such as coal, have come up against severe technical deficiencies in mining technology and transport bottlenecks. The degree of mechanization and mechanical coal cutting in China's coal mines is considerably lower than the situation in Western Europe or the United States.[100] Even if output could be rapidly expanded, it is often problematic to transport coal from the prime mining regions to those areas of greatest need. Port facilities and China's highway system are also underdeveloped in terms of the country's pressing need for adequate transport capacity. On-going efforts have been made to confront these problems. For instance, the Chinese signed a U.S. $1.5 billion loan and assistance agreement with the Japanese in early 1980 for development of six projects—all of which were energy-related. Work on these projects, however, has been partially curtailed as part of China's readjustment efforts. Basic improvements will have to be made in the transport area and related infrastructure before China's energy problems can be rectified.

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[98] World Business Weekly, June 23, 1980, pp. 15–16.
[99] New York Times, June 30, 1981, p. D18.
[100] FBIS-PRC, May 12, 1981, p. A1.

The financial constraints restricting the import of large-scale capital-intensive technology projects also are very severe, particularly in view of China's continued reluctance to incur high levels of foreign debt at prevailing commercial rates.[101] The nature of the problem facing China is not merely a shortage of foreign exchange. China has indicated a willingness to pay for desired equipment, as in the case of the cancelled petrochemicals projects, on a cash basis. Additionally, the Chinese have accepted financial assistance and loans at concessionary rates from international organizations such as the World Bank.[102] They cannot, however, afford to acquire all the technology, equipment, and machinery that they have examined or have shown an interest in since the inception of the modernization program. Moreover, the Chinese government's ability to pay the local costs of undertaking large projects involving foreign participation is limited. Until China's domestic financial problems can be rectified, the country will not be in a position to expend large sums of money on major purchases. (Note: A more detailed examination of China's foreign exchange problem and domestic financial situation are presented elsewhere in the volume.).

I. CONCLUSION

Throughout this paper, reference has been made to the major constraints that will limit China's ability to successfully absorb foreign technology to support its modernization effort. Several major points have emerged. First, the Chinese will have to concentrate more on remedying some of the basic technical and managerial deficiencies in their S&T system before the import of advanced technology will have an appreciable impact on the Chinese economy. Second, ineffective management, as well as technical backwardness, are critical obstacles confronting Chinese attempts to successfully use foreign technology. In particular, the Chinese lack necessary skills in such areas as project integration and systems management to efficiently undertake large scale development projects containing significant inputs of foreign technology and equipment. Third, a critical shortage of qualified technical personnel is a major problem that will continue to hamper Chinese efforts to utilize foreign technology to spearhead modernization of the domestic S&T system. Until the Chinese can improve their existing system for training and allocating scarce technical personnel, it will continue to be difficult for China to use foreign technology on a cost-effective basis. Fourth, uneven performance with respect to translating research results into usable manufacturing technologies will limit the impact of borrowed technology on economic and S&T modernization. Significant upgrading of design and process capabilities will be needed to overcome existing shortcomings.

The Chinese have made significant progress in addressing many of their major deficiencies, and have done well in view of existing resource constraints. Their ability to set in place a basic foundation for both industrial and agricultural development is indeed significant, particularly in comparison with the experiences of other developing nations. The Chinese effort is even more remarkable in view of the country's large population and food problems, and the huge difficulty involved in administering an economy as large and diverse as that of China. Developments in science and technology have also been appreciable, especially when one takes into account the impact that political turmoil has had on the functioning of Chinese scientific and, technical personnel and organizations. The basic elements for continued industrial development and economic growth have been created, and were it not for the Cultural Revolution, the Chinese economy and S&T system might have made a smoother transition into its current modernization mode. Even without the current emphasis on modernization, the Chinese economy would have been able to "muddle through" the next few years without extreme problems.

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[101] Asian Wall Street Journal, Apr. 7, 1981, p. 1; FBIS–PRC, May 11, 1981, p. D1.
[102] Washington Post, Dec. 22, 1980, p. D1.

The fact remains, however, that many of the constraints noted above are long-term problems, ones that will require at least several years to overcome. In spite of the fact that China's experience over the last three decades appears satisfactory from the perspective of the Third World, the situation appears much more problematic from the standpoint of the economic and S&T achievements and capabilities of the advanced Western nations—the group that China, in many respects, is trying to emulate. The ability of the Chinese leadership to address their problems represents a valuable first step, but recognizing ones problems is a long step away from solving them. In the final analysis, the Chinese will have to accept a more gradual modernization process and adhere to a development strategy that is geared to confronting some of the more fundamental shortcomings of the S&T and economic systems. Technical assistance rendered from abroad will have to be of the close-support type, and will necessitate managerial assistance, as well as technology transfers. This is true in the case of both civilian and military-related modernization efforts. Because of the Chinese desire to concentrate future technology-related purchases on know-how rather than whole plants and equipment, few major sales will take place. Rather, it will be essential for China to forgo some of the more "prestigious" technologies and items, and to secure the types of foreign know-how that will aid the country in its continued efforts to build an S&T foundation conducive to long-term technological self-reliance.

SCIENTIFIC AND TECHNOLOGICAL TRANSFER: AN ASSESSMENT OF SOCIAL CONSEQUENCES

By Amy Auerbacher Wilson*

In the post-Cultural Revolution era of the late 1970s and early 1980s the Chinese leadership has advocated significant changes in policy, in both domestic and international terms. From the standpoint of foreign policy a major departure from the past has been China's current receptivity to interacting with the world-at-large. In commenting on China's present willingness to open the door wider to non-Chinese ideas and presence, one Western journalist who has long observed that society contends, "This is not the same as the pro-Western tilt of Chinese foreign policy (which Mao himself wrought as he turned against Russia). New is the level of openness to international economic forces, and to foreign cultural influences."[1] Noteworthy among the shifts in policy under the Four Modernizations drive are the positive sanctions now given to transfers of technology between the People's Republic of China (PRC) and the highly developed nations of the West.

The purpose of this paper is to assess some of the ways in which international scientific and technological transfers have had an impact on Chinese society in the five years since the death of Mao Zedong. Analysis is confined here to three interrelated questions—selected from a much larger universe of problem areas—and is primarily concerned with outcomes for the S and T sector of Chinese society. First, in what ways is the interchange of knowledge, of personnel, of organizational forms, of material between the People's Republic of China and technologically superior exchange partners having an effect upon the prevailing system of social stratification in China? Is this interchange altering the allocation of material and nomaterial benefits and the distribution of power and responsibility? Particularly among scientific/technical research workers, the group considered to be the backbone of scientific development, how are sophisticated processes of technological acquisition and assimilation affecting individual and collective expectations and circumstances?

A second and related question regarding social differentiation examines the consequences of increased opportunities for international science and technology relations for different generations, or cohorts, of specialists. Third, what are the discernible cultural ramifications of scientific and technological exchanges with the United States and other industrialized, capitalist countries for the value system created in China after 1949? How great is the risk of revolutionary and socialist ideals being subverted? An ongoing political issue for the Chinese has been whether they can indeed achieve modernization without Westernization, as many PRC officials public claim. A typical reference to China's unique path to modernity is to be found in Deng Xiaoping's report on the current situation and tasks, published early in 1980: "Therefore when I am talking to foreigners I say our four modernizations are Chinese-style."[2]

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[1] Ross Terrill, "China Enters the 1980s," Foreign Affairs 58 (Spring 1980): 923.

This analysis is necessarily tentative, for China's prevailing policies regarding technology transfer are of but relatively short duration. Moreover, the questions addressed are elusive ones to answer in the Chinese context. Nevertheless, an interim assessment of certain social consequences of technology transfer is feasible and clearly useful to those concerned with American foreign policy as well as to other analysts who would understand China today.

This paper focuses on the period just prior to and since normalization of diplomatic relations between the United States and the People's Republic of China and takes into account the burgeoning number of public and private activities engaged in by both countries that have scientific and technological implications. It has been noted that official endorsement of scientific research and development and active participation in the transfer of technology so evident in the PRC under its Four Modernizations program are not new.[3] Certainly the Soviet experience of the 1950s was not insignificant in size and may indeed rival the present effort. It is estimated that by the time of the withdrawal of Soviet technicians in 1960 some 11,000 specialists had spent time in China.[4] Conversely, approximately 38,000 Chinese were sent to the Soviet Union between 1949 and 1965 to receive technical training, with a small number going to other Eastern bloc countries.[5] In 1970, however, nonsocialist countries were replacing socialist ones as China's principal partners in the various exchanges of technology. Within a very few years thereafter China was purchasing complete plants from the West, a move that also entailed using foreign technicians.

When the Cultural Revolution is taken as the baseline for comparison, rather than the Soviet-inspired period that preceded it, recent changes in S and T policy appear quite dramatic, for the Cultural Revolution had seriously disrupted China's educational system and played havoc with scientific research from the mid-1960s into the mid-1970s. In comparison with the isolation and stagnation of that decade, by the late 1970s the Chinese approach to technology acquisition had increased to the point where China had become the largest purchaser of modern technology among the less developed countries.[6] Although the emphasis is on importation of technology, S and T policy has now broadened to include sending Chinese scientists and technicians abroad, receiving foreign specialists in Chinese institutions, and encouraging Chinese intellectuals to participate in binational and multinational meetings. In particular, the decision to have large numbers of Chinese study in nonsocialist societies—primarily in the United States—has been an unprecedented move for the PRC.

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[2] "Text of Deng Report on Current Situation, Tasks," Chengming (Mar. 1, 1980); translated in Foreign Broadcast Information Service, Daily Report of the People's Republic of China (hereafter FBIS) (Mar. 11, 1980), Supplement: 17.

[3] Robert Dernberger, "Economic Development in Contemporary China: The Attempt to Limit Dependence on the Transfer of Modern Industrial Technology from Abroad and to Control Its Corruption of the Maoist Social Revolution," in Frederic J. Fleron, Jr., ed., Technology and Communist Culture: The Socio-Cultural Impact of Technology under Socialism (New York: Praeger Publishers, 1977), p. 252; Hans Heymann, Jr., "Acquisition and Diffusion of Technology in China," in U.S. Congress, Joint Economic Committee, "China: A Reassessment of the Economy," 94th Congress, 1st session, 1975, p. 678; cited also by Shannon R. Brown, "China's Program of Technology Acquisition," in Richard Baum, ed., China's Four Modernizations: The New Technological Revolution" (Boulder, Colorado: Westview Press, 1980), pp. 157–158.

[4] Albert Feuerwerker, "Characteristics of the Chinese Economic Model Specific to the Chinese Environment," in Robert F. Dernberger, ed., "China's Development Experience in Comparative Perspective" (Cambridge: Harvard University Press, 1980), p. 294.

[5] Leo A. Orleans, "Manpower for Science and Engineering in China, Science in the People's Republic of China Background Study No. 4. Prepared for the Subcommittee on Science Research and Technology of the Committee on Science and Technology, U.S. House of Representatives, 96th Congress, 2nd session, May 1980, p. 33.

Chinese policies and practices that promote international technology transfers are imbedded within a larger web of national S and T plans. Moreover, pivotal though the development of science and technology is considered to be for China's future, it is only part of the wider program for modernization that includes upgrading industry, agriculture, and national defense. Evaluating the effects of technology transfer per se upon Chinese social institutions is thus difficult, with analysis further complicated by the fact that since the initial announcement of the ambitious Four Modernizations campaign, substantial alterations and amendments have been made, overwhelmingly in the direction of retrenchment from and scaling down of earlier goals.

The fundamental directions for Chinese science policy in the 1980s were spelled out at the 1978 National Science Conference, which also redressed previous "errors" attributed to the Gang of Four. Deng Xiaoping affirmed that science is correctly viewed at part of the forces of production, not of the superstructure. Since science has no class nature, it follows that scientists are bona fide workers, not intellectuals somehow set apart from manual laborers. Insofar as science is recognized as a global activity, it is fitting and proper that Chinese science strive toward attaining world levels.[7] Vice Premier Fang Yi's remarks at that 1978 science conference summed up the then-dominant Chinese position on the international character of science and technology: "Science and technology are the common treasures of mankind. All countries and nationalities have their own merits and characteristics, and exchanges can help them assimilate each other's strong points and blaze new trails. An important way to develop science and technology at high speed is to utilize fully the latest achievements in the world in science and technology and absorb their quintessence."[8] By contrast, Tong Dalin, Vice Minister of the State Scientific and Technological Commission, during a February 1981 interview with Xinhua, indicated a departure from a catch-up policy. The benchmark for S and T during the period of economic reform and readjustment should be Chinese, not world, standards: ". . . foreign scientific and technological advances should be studied for assimilation into China's own research."[9] Among the errors of prior S and T policy, cited in a Guangming Ribao commentary on January 15, 1981, and attributed to the pernicious influence of the "left," is the problem of "blindly striving to catch up with and surpass advanced countries and losing contact with Chinese reality."[10] Interestingly, Fang Yi's newsworthy speech at the May 1981 Chinese Academy of Sciences (CAS) Scientific Council meeting, reprinted on the first page of the Guangming Ribao one week later (May 27, 1981), touches only lightly on the international elements in China's science and technology efforts, concentrating instead on the apparently more pressing problems associated with Academy work and with national scientific undertakings.

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[6] Dernberger in Fleron, "Technology and Communist Culture," op. cit., p. 235.

[7] Deng Xiaoping's remarks of Mar. 18, 1978, "Speech at Opening Ceremony of National Science Conference", appeared in the Beijing Review 21 (May 24, 1978) : 9–18.

[8] Fang Yi, "Report to the National Science Conference, Mar. 18, 1978," in Chinese Science and Technology 1 (Summer 1979) : 37–38.

[9] "Xinhua Interviews Science, Technology Official," Xinhua (Feb. 23, 1981) ; FBIS (Feb. 24, 1981) : L 17.

As the concept technology transfer is used here, it is extensive enough to encompass the various levels of scientific relations that China has with the more developed nations of the world—professional, governmental, and commercial.[11] The term refers to the circulation of technical know-how across national boundaries and includes the acquisition of equipment and of plants as well as the exchange of information and, most importantly perhaps, people.[12] Not only have thousands of students and "visiting scholars" already been sent abroad, with future projections showing significantly higher figures, but many Chinese professionals at home have also now had opportunities for face-to-face contact with foreigners. As foreigners in China are well aware, however, S and T transfer is a process that China chooses to regulate carefully. After the enthusiasms of 1978, a more circumscribed approach to scientific and technological transfer has ensued. Whereas Fang Yi in January 1980 spoke positively of "breaking ice" and "opening shipping lanes to traffic," at the same time he was guarded about the proper scope of transfer. "To achieve the best results, the selection of any kind of technology must suit the concrete conditions of a nation or locality with regard to such specific factors as resources, capital, labor, the market and the level of technology. . . . We have a poor foundation to start with and an enormous population. We must not try to do everything foreign countries are doing."[13]

During the present period of economic readjustment the actual import of foreign technologies has been scaled down, and greater discretion has been used in weighing transfer options. A January 1981 statement about S and T policy maintains, "we must persist in mastering, assimilating and digesting foreign scientific and technological achievements. . . . During the readjustment period, our country will proceed in all cases from the needs of the national economy and the conditions of our technological foundations and resources and will only selectively import foreign technology and software."[14] With regard to the flow of individuals, the Chinese still seem to favor such a policy but are monitoring expenditures for technical exchanges more carefully. Vice Premier Gu Mu, in a January 1981 meeting on foreign experts, stressed that the current economic difficulty is temporary and that China's "open door" policy with regard to using foreign experts remains unchanged. Similar sentiments were voiced at the same meeting by Vice Premier Ji Pengfei, and admonishments were given to be friendly to foreign experts and to utilize them, warnings that suggest that visitors have not always been enthusiastically received.[15] As I observed this summer in Beijing, while accompanying a group of American economists, the practice of isolating "foreign experts" within their own compounds when not working does not facilitate communication and friendships.

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[10] "Science and Technology Must Be Developed in Coordination with the National Economy in the Course of Readjustment," Guangming Ribao (Jan. 15, 1981); FBIS (Feb. 6, 1981): L 13.

[11] Richard P. Suttmeier, "Politics, Modernization, and Science in China," Problems of Communism (January/February 1981): 32.

[12] Denis Goulet The Uncertain Promise: Value Conflicts in Technology Transfer (New York: IDUC/North America, 1977), p. 6.

[13] Fang Yi "Several Current Problems in Scientific and Technological Work," Hongqi (Jan. 16, 1980), translated in Joint Publications Research Service (thereafter JPRS), 75317 (Mar. 17, 1980): 4.

[14] "Science and Technology Must Be Developed, op. cit."; FBIS: L 14.

In an assessment of the societal consequences of technology transfer for the PRC, one obvious question concerns the effects of these new S and T policies and practices upon the system of social stratification, that is, upon the distribution of prestige, power, and "property." Insofar as China's renewal of S and T contacts with the developed world works to the advantage of some individuals and groups and to the disadvantages of others, structural realignments, some tension-provoking, may be expected in the Chinese stratification system. Technology transfers are apt to impinge most directly upon Chinese social stratification by affecting within-class and between-class differentiation of scientists and engineers. In the former case, the question is whether the importation of foreign machines and know-how alters existing allocations of scarce resources and of opportunities to the various categories of S and T personnel. In the latter instance, one needs to assess the extent to which processes of technology acquisition and absorption differentially reward scientific and technical workers as a group, versus other segments of Chinese society, in economic, social, or political terms.

During the current Four Modernizations campaign, in a policy shift related to the endorsement of technology transfers with industrialized countries, China has been advocating an ameliorated position for intellectuals within the social hierarchy. An important ideological change is that intellectuals are no longer to be considered as class enemies, as the "stinking ninth category." Zhou Peiyuan, recounting in 1979 the hostility directed at intellectuals under Lin Biao and the Gang of Four, likened intellectuals in those earlier Cultural Revolution times to "birds that were startled by the mere twang of a bowstring." [16] When the National Science Conference of 1978 upheld that the majority of intellectuals were reliable members of the working class, Zhou felt that this rehabilitative step "thus shattered the spiritual shackles that had long been placed on the intellectuals and basically mobilized the enthusiasm of the broad ranks of scientific and technological workers." [17]

In this light, the prototypical self-criticism of Hua Luogeng, generally recognized as the foremost mathematician in China today, which was published in the Renmin Ribao in 1969, is revealing. Denouncing the influence of bourgeois intellectuals, Hua admitted, "I am one from the old society, deeply influenced by the old way of thinking. In the ranks of intellectuals I become a living example of 'achievement of fame and academic standing' and a 'self-made man,' a living instrument who has been deeply poisoned by revisionism, in turn poisoning others just as deeply." [18] By contrast, in 1980 Hua, who is once again a recognized leader in the Academy and who in fact just became a Party member, made a successful scholarly exchange visit to the United States, spending time with mathematicians at Princeton University and other academic centers.[19]

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[15] "Gu Mu, Ji Pengfei at Meeting on Foreign Experts," Xinhua (Jan. 5, 1981); FBIS (Jan. 6, 1981): A 2–3.

[16] Zhou Peiyuan, "China's Science in the Past Six Decades," Hongqi 6 (June 1, 1979); JPRS 73956 (Aug. 3, 1979): 117.

[17] Ibid: 117.

[18] Hua Luogeng, "Learn Again to Dedicate Strength to Educational Revolution," Renmin Ribao (June 8, 1969); Survey of Mainland China Press (hereafter SCMP), 4438 (June 17, 1969): 2.

Lately not only has the lot of Chinese intellectuals improved subjectively, but also a conscious effort has apparently been made to better their objective situation in terms of salary, housing, working conditions, and so forth. Nearly a decade ago a rather wide range of academic salaries was reported, ranging from 60 yuan per month for instructors to more than 300 yuan for senior professors.[20] Lately incomes have been on the upswing for S and T personnel (and for other urban workers), but inadequacies and disparities apparently persist within the ranks of qualified scientists and technicians, some of whom have experienced unjust discrimination. By contrast, some scientific workers with outmoded technical training and skills, generally brought to the fore during the Cultural Revolution, are now fearful of losing perquisites gained with seniority and, quite understandably, embrace the security of their "iron rice bowls."

Championed by Deng Xiaoping, intellectuals are now in a more advantageous political position, despite lingering prejudices. Scientists, in particular, are riding quite high politically, especially those in leading positions in the research institutes of the Chinese Academy of Sciences and, to a lesser extent, in the industrial ministries.[21] In 1980 a CAS forum on personnel issues still found it necessary, however, to remind cadres that "redness" is not to override expertise. "The consensus was that there should be no discrimination between party members and nonparty persons whether in giving academic degrees or ranks, in assigning academic jobs or in choosing persons to make inspection tours abroad or to receive foreign guests. It will not do to exclusively depend on communist party members to achieve the four modernizations." [22]

Meanwhile the political role of scientists and other intellectuals is also becoming more active as they are called upon to help formulate and evaluate policy and, in some cases, are being coopted into high-level bureaucratic slots in the party or other organizations. As a case in point it was noted early in 1981 that a number of prominent scientists and scholars had been appointed to provincial-level leadership positions where they would presumably apply their expertise to local development problems.[23] These events raise some doubts about Zhou Peiyuan's observation of June 1979 that it is easier for S and T personnel to have jobs than authority.[24] What the scientist asks for is not an official title, according to Zhou, but a greater say in research matters including those that affect the pace of China's modernization.[25] Fang Yi, in his May 1981 report to the meeting of the Scientific Council of the Chinese Academy of Sciences, spoke of the appropriate role of the Scientific Council of CAS. Formerly serving simply as a consultative body, the Council is to become the highest policy-making unit in the Academy. Furthermore, the Council is to take on new tasks and functions that aim broadly at the national integration of science and technology and of social and economic development. Council members, Fang Yi asserted, have both the knowledge and the experience to offer advice on scientific and technological matters to the Central Committee of the CCP and to the State Council.[26]

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[19] For a report on the visit to the United States in September/October 1980 of the Chinese Pure and Applied Mathematics Delegation, of which Hua was Chairman, see China Exchange News 8 (October-December 1980) : 17.

[20] Ross Terrill, 800,000,000: The Real China (Boston: Little Brown, 1972), pp. 127 and 130; cited also in Martin King Whyte, "Inequality and Stratification in China," China Quarterly 64 (December 1975) : 692.

[21] As a point of reference, China's corpus of scientific and technical workers, as of 1979, reportedly numbered 6 million out of a total of 25 million intellectuals. However, the entire scientific/engineering research pool is in the range of 300,000, of whom one-tenth or 30,000 are "independent researchers." See "China's Intellectuals—Part of the Working Class," Beijing Review 13 (March 31, 1980) : 20 and Suttmeier, "Politics, Modernization and Science," op. cit. :30-31.

[22] "Science Academy Discusses Personnel System Reform." Xinhua (Oct. 13, 1980); FBIS (Oct. 14, 1980) : L 29.

[23] Parris H. Chang, "Chinese Politics. Deng's Turbulent Quest," Problems of Communism (January/February 1981) : 18.

At the same time the meaning of prestige accorded Chinese scientists is becoming more tangible with the reissuance of ranks and titles in academic institutions, the granting of academic degrees, and even competition among researchers for cash awards. The cadre work forum sponsored by the CAS in October 1980, which discussed needed personnel reforms, seemed somewhat defensive about such steps. "Giving technical titles, academic degrees or academic ranks should be used as a way to assess a person's work performance or managerial ability." [27]

Whereas the current appreciation of intellectuals and especially of scientists is congruent with the traditional Chinese reverence for education, a distrust of "mental workers" has also been a theme in modern Chinese history. As China once again sends scholars and students abroad, the potential exists for the re-emergence of an elitist group of foreign-trained specialists. Scientists who are deemed most valuable to modernization efforts, those who are apt to have intimate ties with the international science establishment, are in a position to be accorded considerable prestige if not economic and political rewards. In the PRC political vacillations since 1949 have been such, however, that belonging to any privileged status group can put one in a precarious, if not perilous, position. Indeed, in the Chinese press a number of criticisms have recently been leveled at S and T personnel who squander scarce resources or otherwise take advantage of their special status. One malpractice noted early in 1981 was the loading of delegations to the United States with administrators wishing to tour rather than with technicians who could most benefit from site visits.[28]

The Chinese most directly affected by international S and T activities are those participating in Sino-American and other similar bilateral exchange programs. Among the several categories of academic visitors to the U.S., the most important at this juncture have been the "visiting scholars" and, secondarily, matriculated graduate students, both of whom are normally engaged in exchange programs of a year's duration or more. Primarily a middle-aged group of professionals, practitioners in the natural and engineering sciences, more than 3,000 Chinese have already been selected to receive advanced training in American universities and research institutes at PRC government expense. (And they are now matched by a similar number of Chinese students in the States who are receiving university stipends or are otherwise privately supported.) As a group, the men and women chosen for advanced study in the West are very much heirs to the legacy of the Cultural Revolution, their careers frequently stunted by the long moratorium on educational and scientific progress. Generally these individuals have been subordinate to older research colleagues who may have studied in the West before Liberation or spent time in the Soviet Union in the 1950s. Quite aware that scientists and technicians will be critical to China's efforts to absorb foreign technology and modernize successfully, the PRC leadership pins great hope on the research personnel sent abroad for training. Exchangees, therefore, carry a heavy burden. During visits to major American campuses over the past two years, accompanying delegations of Chinese academicians, I have heard visiting scholars and graduate students exhorted to study diligently and to be unreproachable models.

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[24] It should be noted that whereas the talents of scientists and technicians are now being more rationally employed than during the Cultural Revolution, a persistent problem of misallocation of specialized personnel and underutilization of expertise remains. The New York Times cited a People's Daily article on this subject: ". . . at the end of 1978, 196,000 scientists and technicians were out of work. This is more than the total number of scientists produced by all of China's universities in a single year." "Skilled Manpower Wasted, China says." New York Times (Dec. 12, 1980): 14.

[25] Zhou, "China's Science," op. cit.: JPRS: 118.

[26] Fang Yi, "Text of Report at Science Meeting." Guangming Ribao (May 27, 1981).

[27] "Science Academy Discusses," op. cit.: FBIS: L 29.

[28] "Chinese Press Accuses Bureaucrats of Wasting Money on Foreign Trips," New York Times (Feb. 1, 1981): 10.

Despite some handicaps of inadequate language facility, of overly narrow academic background, and of basic unfamiliarity with the latest advances in science and technology, the pioneering group of Chinese that is affiliated with dozens of American institutions has been fulfilling its ambitious mission.[29] As Chinese visiting scholars and students return home from abroad, these newly accredited experts are likely to be under continued pressure to demonstrate that the investment in them has been a sound one and that their training in high-technology fields is applicable to China's stubborn development problems.

Within the past couple of years there seems to be a general trend in the PRC in the direction of increased dualism, of a greater degree of sectoral inequality and a greater imbalance between more and less modernized parts of the social system. Under the Four Modernizations as the practice of science in China has become increasingly sophisticated and international in its outlook, the division of scientific labor has sharpened. The functionality of the so-called "open-door research" combination of workers/peasants, cadres, and scientists, for example, now seems rather unwieldy and less germane to present tasks. In any event the changing nature of scientific work has exacerbated frictions that existed between administrative cadres responsible for scientific/technical programs and S and T specialists themselves. As Suttmeier observes, nontechnical cadres have been suspicious of the substantial debate during the past year and a half about raising the professional competence of cadres.[30] Deng Xiaoping, in a January 1980 report delivered at a party cadres conference, made a point of saying that international exchanges have necessitated the upgrading of professional standards and of specialized knowledge among leading party cadres. "Nobody can be content with being backward." [31] More than a year later Fang Yi openly legitimized the autonomy of the academic departments in the Academy of Sciences and bestowed the scientists, rather than administrative cadres, with ultimate decision-making authority. "It is also necessary to reform the existing irrational system so as to expand the power of the research institutes to manage their own affairs." Furthermore, Fang emphasized that administrative cadres should put higher demands on themselves; it is their urgent duty to master the appropriate knowledge and to become specialized in certain fields.[32]

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[29] "Survey Summary: Students and Scholars from the People's Republic of China Currently in the United States." U.S.-China Education Clearinghouse, a joint project of the Committee on Scholarly Communication with the People's Republic of China and the National Association for Foreign Student Affairs (Washington: April 1980). A second questionnaire was distributed to more than 300 institutions in the spring of 1980. Results are being tabulated and will be available in 1982 through the Clearinghouse.

[30] Suttmeier, "Politics, Modernization, and Science," op. cit.: 25.

As a collectivity, scientists and engineers are in considerable demand in China, rewarded in the social hierarchy because they are currently in short supply in terms of quantity and of quality. Despite common values and interests, however, China's scientific circles are subject to the same kinds of cross-pressures and divided loyalties that have characterized other social groups in the PRC, where the major cleavages are said to have been along generational, regional, and bureaucratic lines.[33] The analyst of social structure in contemporary China cannot help but be struck by the continued conflict between generations. Since Liberation a generation, or cohort, has been recognized as a meaningful social category in any number of Chinese settings such as the party and the military. In terms of the intelligentsia, the loss of a generation of specialists during the decade-long Cultural Revolution will long be felt, as numerous foreign and Chinese commentators have noted.[34] It is equally apparent today that subsequent cohorts of post-Cultural Revolution scientists and engineers—some being trained abroad, others educated at home—will leave a lasting imprint upon China's intellectual landscape.

A unique aspect of the professional life of Chinese scientists, according to Suttmeier, is the relation between successive cohorts. "These intergenerational relations have three dimensions. One is simply the difference in chronological ages. The second concerns differences among age groups based on the different scientific traditions dominant during the professional socialization of the scientists in each group, such as the Western 'bourgeois' tradition, the Soviet tradition, and the post-Liberation indigenous tradition. Finally, there are superior-subordinate differences based on normal position in the organization in which a scientist works, a relationship that has been a function of age and training." [35]

Age and historical time, or experience, the two axes that characteristically locate cohorts, have heightened significance in China today. Without regularized provisions for succession or superannuation, bureaucratic positions in the PRC have been virtual guarantees of lifelong tenure. Furthermore, because seniority principles have normally overridden those of merit, mobility opportunities for younger generations have been sluggish, if not foreclosed. In January 1980 Fang Yi expressed open concern about the seniority issue: "At the present moment it is nearly impossible to find a professor or scientist in his thirties. Could it be that there actually are no such talents? Certainly not! The trouble is that in staff promotions preference is given to rank and length of service." [36]

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[31] "Text of Deng Report," op. cit.; FBIS: 25.

[32] Fang, "Text of Report," op. cit.

[33] William W. Whitson, "The Political Dynamics of the People's Republic of China," Chinese Economy Post-Mao: A Compendium of Papers, Joint Economic Committee, Congress of the United States, Nov. [illegible] 1978, p. 64.

[34] See, for example, the report on a 1977 American delegation to China, Astronomy in China (Washington: National Academy of Sciences, 1979), pp. 66–67, or Frederic Wakeman, Jr., ed. Ming and Qing Historical Studies in the People's Republic of China (Berkeley: University of California Institute of East Asian Studies, Center for Chinese Studies, Chinese Research Monograph 17 (1980).

[35] Richard P. Suttmeier, Science, Technology and China's Drive for Modernization (Stanford: Hoover Institution Press, 1980), p. 41.

As a consequence of prevailing personnel practices, the Chinese political system has often been described as a gerontocracy.[37] Today these practices are being questioned and, in some instances, being changed. Much debate at the Third Session of the Fifth National Peoples Congress (NPC), convened in September 1980, centered on questions relating to mobility, with Hua Guofeng and other national leaders advocating the promotion of promising young people. As Ren Jiyu, NPC deputy from Shanghai, cautioned, "Small trees will not grow under the shade of big trees." [38] Fang Yi's recent resignation from the CAS presidency signifies a break with communist incumbency traditions. In remarks prefatory to his retirement announcement, he argued that the tenet of lifetime tenure for leadership job should be changed.[39]

An emergent age gap between younger and older intellectuals, frequently noticed by visitors to China,[40] has apparently been instrumental in inspiring new education and science directives, particularly the startling decision to speed up modernization by sending a vanguard of younger scientists and engineers to the United States and other capitalist countries for graduate training and advanced research experience. In 1978 Deng Xiaoping conceded at the National Science Conference that "there is an age-gap in the (scientific and technical) force that makes the training of a young generation of scientific and technical personnel all the more pressing." [41] For some time to come generational differences among S and T specialists, ironically, are likely to be aggravated by virtue of some of the very policies intended to smooth out and eventually eradicate the so-called age gap. This seems true of many bilateral S and T arrangements that have disproportionately involved older, Western-trained scientists. On the domestic front as well, certain measures being enacted can be expected to accentuate and dramatize cohort differentiation in the PRC by concentrating on the training of younger people rather than on the retraining of middle-aged workers. Henceforth, domestic allocations to education will support a "tracking" system and will therefore be used primarily to identify and nurture Chinese youth with unusual talents.[42] When the $200 million education loans from the World Bank begin to flow into the PRC, some two dozen Chinese universities will receive a transfusion of funds, stimulating the development of science and engineering programs, yet in all likelihood further intensifying generational inequalities and tensions.[43] Similarly, the composition of Chinese going abroad for advanced training will change after 1981, when the first contingents of young post-Cultural Revolution university students are graduated.

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[36] Fang. "Several Current Problems," op. cit. : JPRS : 9.

[37] Lowell Dittmer, "China in 1980: Modernization and Its Discontents," Asian Survey 21 (January 1981) : 46.

[38] "Further Reportage on NPC Deputies," FBIS (Sept. 16, 1980) : L 6.

[39] Fang. "Text of Report," op. cit.

[40] References to this scientific manpower problem are repeatedly found in Leo A. Orleans, ed., Science in Contemporary China (Stanford: Stanford University Press, 1980). For example, Saunders MacLane, "Pure and Applied Mathematics," p. 63; Nicolaas Bloembergen, "Physics," p. 89; John D. Baldeschwieler, "Chemistry," p. 145.

[41] Leo A. Orleans, "China's Science and Technology: A Review," (Washington: National Academy of Sciences, National Research Council, Commission on International Relations, 1979), p. 181.

In the past couple of years China's foremost political leaders and science administrators have repeatedly dwelt on age or generational problems. Deng Xiaoping, in a report delivered at a CCP cadres conference early in 1980, brought up the matter of cultivating fresh talent and found it regrettable that although cadres in their fifties are China's major treasure, not many of that age were present at the meeting that day.[44] Recognition of generational problems among scientists was underscored by the convening of a national-level conference in January 1980 on the proper utilization of the talents of young and middle-aged S and T workers, sponsored by the Bureau of Scientific and Technological Personnel under the State Council.[45]

In the same month Fang Yi, in a discussion of scientific and technical work published in Hongqi, made several pointed references to the fact that the young and middle-aged, who gained their major work experience during the abnormal Cultural Revolution period, are presently at a disadvantage.[46] More recently, Fang Yi's speech to the Scientific Council of the Academy, delivered in May 1981. was sprinkled with observations about different age groups and the proper behavior of young, middle-aged, and old scientific and technical workers. Various strengths and shortcomings of each age group were enumerated. Older scientists should be looked upon as models and should set worthy personal examples, particularly to counteract an unhealthy work style—presumably prevalent among younger scientists—that resorts to deception, plagiarism, and philistinism. Young researchers were exhorted to be more persistent and not to dabble. In turn, the old should respect and pin hopes on those who are middle-aged and young. "Those of us who are a bit older have many strong points, but after all we are not in top form. We are not above the law of nature."[47]

China's growing involvement with international technology transfers over the past few years raises a number of fascinating albeit thorny questions about the cultural implications of these actions. This paper concludes with a brief assessment of cultural changes in the PRC—changes in values and attitudes, norms and ideology—that appear to be correlated with, if not determined by, these new directions in S and T policy. History has repeatedly demonstrated that heterodoxy and factionalism, not orthodoxy and unity, have characterized Chinese political culture since 1949. Not all elements of the CCP leadership nor all strata of Chinese society have wholeheartedly favored establishing broad, multidimensional relationships with the United States and other capitalist countries. (And doubts about the sagacity of the evolving Sino-American relationship exist in the U.S. as well.) In several quarters in the PRC there is serious concern about the tainting effects of Western bourgeois ideals and practices. This worry extends even to the pragmatic Deng Xiaoping: "It is impermissible to turn our learning of certain technical and management experiences of capitalist society into the worship of capitalist foreign countries, to be corrupted and seduced by capitalism and to lose the national pride and self-confidence of socialist China." [48] The century-old dilemma thus remains: How to reconcile China's quest for modernization with an antipathy to Westernization?

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[42] Susan L. Shirk, "Educational Reform and Political Backlash: Recent Changes in Chinese Educational Policy," Comparative Education Review 23 (June 1979) : 183–217.

[43] "World Bank Plans Major China Loans," Washington Post (June 25, 1981) : B 3.

[44] "Text of Deng Report," op. cit. : FBIS 20–21.

[45] "Official Notes Value of Middle-Aged Scientists," Xinhua (Jan. 21, 1981) : FBIS (Jan. 22, 1981) L 22–23.

[46] Fang, "Several Current Problems," op. cit.

[47] Fang, "Text of Report," op. cit

Borrowing Thomas Kuhn's now-classic thesis about the structure of scientific revolutions, one may heuristically interpret the end of the Cultural Revolution and the exposure of the Gang of Four as evidence that the Chinese could no longer ignore the "anomalies" in their strategy for socialist development.[49] The multiplicity and gravity of unsolved problems brought to light after the death of Mao Zedong had reached a crisis point. In response to the perception of crisis, a new paradigm for development was introduced, China's Four Modernizations plan. Among the major policy commitments of the Four Modernizations program has been a solid endorsement of scientific R. & D. that has prompted pursuing scholarly contacts and other forms of exchange activities with the developed world after years of minimal interaction. Can the Chinese revolutionary model of ascetism and austerity, of self-reliance and struggle endure a close encounter with alternative world views? To expect significant changes in the Chinese value system to have occurred as a consequence of post-Cultural Revolution policies may well be premature. Moreover, it has been all too easy for foreigners, throughout this century, to exaggerate the impact of the outside world upon Chinese society. In a recent magazine article Orville Schell wisely admonishes Americans: ". . . we would do well to remember that those newly Westernized aspects of China which so reassure us are only a thin scrim over a deeper and more complicated Chinese reality." [50]

Technology can be both the bearer and the destroyer of values, as Denis Goulet has observed.[51] The experiences of the Third World richly document the fact that when technologies are transferred from richer to poorer countries, value conflicts are likely. In recent years the PRC has changed course by intensifying contacts with the more developed countries in an ambitious effort to modernize. Authorities in China have typically been suspicious, however, not only of foreign influences but also of pluralism and diversity within their own institutions. Certain value conflicts noted in China today seem to reflect the unsettling consequences of exposure to Western lifestyles and notions for prevailing patterns of thought and action. Indeed, the so-called "crisis in faith," noted among Chinese youth, is, in part, a response to Western materialism and an indication of rising expectations. A prototypical concern with the excesses that can accompany modernization is the denunciation that appeared in the *Tianjin Ribao* in January 1981: "What we want to build is a socialist country with high-level material as well as spiritual civilization. The so-called spiritual civilization refers to highly developed science, education and culture as well as communist ideology, ideals, morality, and discipline, revolutionary stand and principle, and comradely relationships between individuals. Neither very high levels of material affluence nor very high levels of education are needed to achieve this end."[52]

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[48] "Text of Deng Report," op. cit.: FBIS 19.

[49] Thomas S. Kuhn, "The Structure of Scientific Revolutions" (Chicago: University of Chicago Press, 1962).

[50] Orville Schell, "Our Mistakes About China," Newsweek (Feb. 16, 1981): 17.

[51] Goulet, "The Uncertain Promise," op. cit., p. 3.

Some value conflicts in China are seen to be related to alterations in S and T policy. Technology transfers, especially of personnel, have introduced a number of Chinese S and T specialists to novel viewpoints and forms of behavior, some of which contravene their own professional norms. As Suttmeier has remarked, for example, the Chinese have, since Liberation, favored provincialism over cosmopolitanism, yet modern science as a profession is international in scope and hence inimical to localism.[53] Similarly, the canons of scientific research revered by academicians in the United States and Europe call for open access to data and the sharing of information, whereas in the PRC tight controls over communication and secrecy have been organizational norms. In the West science has usually been seen as benefitting from competition, as institutionalized in peer review selection processes. By contrast, the Chinese, until very recently, felt such competitive practices, labeled bourgeois and individualist, ran counter to Maoist values of collectivism, populism, and egalitarianism.

Increased S and T contacts with the West, especially the necessity to import technical equipment and expertise, by definition call into question China's long-standing preference for self-reliance and weaken the hallowed proscription against foreign dependencies. Whereas Chinese insistence upon self-reliance has occasionally imparted an Edisonian flavor to scientific research, in international affairs it has meant isolationism and the abnegation of foreign aid, even in the direst of circumstances. In the post-Mao period China's world role has done something of a volte-face, shifting from donor to recipient of economic and technical assistance. The recent PRC decision to accept United Nations disaster relief was newsworthy. Indeed, it marked a significant change in foreign policy.[54]

Since Mao's death changes in the expression of such democratic values as the right to dissent and free inquiry have made China a focus of world attention. Observers have noted alternating tides of liberalization and of tightening up. Lately a "double hundred" stance has been espoused, but with both the "blooming" and the "contending" very carefully circumscribed. The limits to Chinese democracy were clearly spelled out in Deng Xiaoping's report to a Party cadres conference, delivered in January 1980: "We must forever uphold the principle of letting a hundred flowers blossom and a hundred schools of thought contend. However, this does not mean this principle may be allowed to be used to the disadvantage of the overall situation of stability and unity. To say this principle disregards stability and unity is a misunderstanding and a misuse of it. What we are implementing is socialist democracy, not capitalist democracy." [55] It was in that same speech that Deng was reportedly applauded by those present in the Great Hall of the People when he stated that the "four greats," speaking out freely, airing views fully, holding great debates, and writing big-character posters, were actually remiss and that a Central Committee proposal was forthcoming, advocating their abolition as constitutional measures.

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[52] "Style of Extravagancy Hampering Modernization Denounced," Tianjin Ribao (Jan. 11, 1980) : 1 : JPRS 77631 (Mar. 20, 1981) : 30.

[53] Suttmeier, "Science, Technology and China's Drive," op. cit., pp. 34ff.

[54] "Chinese Shedding Proud Facade, Seek Foreign Aid," New York Times (Mar. 10, 1980) : A 14; "China Consents to Accept a Helping Hand," Asian Wall Street Journal Weekly (Feb. 16, 1981) : 11.

Despite restrictions, in Chinese intellectual circles and in CCP organs issues of freedom of expression and of dissension continue to be debated.[56] It is perhaps revealing that when Lu Jiaxi was installed as the new president of the Chinese Academy of Sciences in June 1981, he stated in his acceptance speech that he plans to practice democracy and carry out the hundred flowers policy of the CCP in the area of scientific work.[57]

Egalitarianism as a social/economic/political end is also an important locus of value conflict in China today. This paper has indicated that stratification patterns in China are changing, with scientific and technical workers experiencing greater degrees of social differentiation, among themselves and in comparison to other groups. Not only do certain staunchly egalitarian practices appear to be ebbing in the PRC; the ideology of egalitarianism is also being challenged. In the opinion of Fang Yi, writing in Hongqi in January 1980, the commitment to egalitarianism in scientific work had been overzealous and counterproductive with regard to promoting talented people: "in our scientific research organs and social circles the practice of egalitarianism poses a serious problem. The selection of 'superior talents' or of 'topnotchers' has met with multiple difficulties." [58]

The Chinese value system, as it has evolved since Liberation, is a complex amalgam of constructs, a syncretic mix of Chinese, modern, and socialist/revolutionary ends. Corresponding to these value constellations in the PRC are constituencies—social groups or categories—that are more or less differentiated by their preferences.[59] In this light the typology devised by Michel Oksenberg and Steven Goldstein in 1974 is enlightening today.[60] The four foreign policy camps they identify form a continuum, with political actors ranked in accordance with their position on the question of the proper route to a Chinese modernity.

Militant fundamentalists, at one end of the continuum, are strongly anti-foreign, isolationist, even xenophobic. In their tough yet utopian viewpoint, a Western presence in China cannot be tolerated. Somewhat less reactionary are the radical conservatives, those, like Mao Zedong, who would preserve the essence of China by means of cautious, selective borrowing of foreign technologies. More positively inclined toward the West are the eclectic modernizers, whose prime spokesman in 1974 was Zhou Enlai. This group is willing to give up some slight degree of independence in order to establish permanent relations with the West. In this camp self-reliance is more muted and is narrowed to mean self-sufficiency. Finally, Oksenberg and Goldstein distinguish a small category of Westernized Chinese, most of whom were in hiding in 1974, who favor China's pursuing wealth and power as a Westernized country.

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[55] "Text of Deng Report," op. cit.; FBIS: 14.

[56] "China Reviewing Freedom Granted Its Intellectuals," Washington Post (May 7, 1981): A 36.

[57] "Academy Chief on New CCP-Scientist Relations," Xinhua (June 26, 1981); FBIS (June 26, 1981): K 4.

[58] Fang, "Several Current Problems," op. cit.; JPRS: 9.

[59] Gordon Bennett, "Traditional, Modern, and Revolutionary Values of New Social Groups in China," in Richard W. Wilson et al., eds., Value Change in Chinese Society (New York: Praeger, 1979), pp. 207–229.

[60] Michel Oksenberg and Steven Goldstein, "The Chinese Political Spectrum," Problems of Communism (March/April 1974): 1–13.

Some seven years later it is heuristic to review this terrain, to map out changes in the distribution of these ideal types across the political spectrum. Although the eclectic modernizers have, by the 1980s, shown significant gains relative to the radical conservatives and militant fundamentalists, the latter two groups should not be prematurely dismissed. Were the balance to shift back to conservatism, the positive valence toward the United States and the West, demonstrated by a high level of PRC participation in technological transfers and by endorsement of other exchanges, could be weakened. At present some of the more enthusiastic Chinese proponents of extensive interaction with the capitalist countries are among those occasionally accused of "Ah Q-ism," that is, blindly following each new idea and movement, like the writer Lu Xun's vacillatory hero.

International transfers of science and technology, an important component of China's post-Mao program of Four Modernizations, are already having a perceptible impact upon several aspects of domestic social structure. In the first place, social stratification is actually undergoing systemic change, with a premium now placed on social attributes relevant to successful technology transfer: graduate-level scientific education, sophisticated technical knowledge and skills, and foreign experience and associations. Distributive patterns are also changing with increases in the relative amounts of power, prestige, and property—the principal components of stratification—accruing to the S and T sector as a whole and to a substantial number of its scientist and engineer members. But it is also apparent that the gap between the top and the bottom of this stratum of S and T specialists is widening, that there are winners and losers in the technology transfer game. New directions in the development of science and technology in the PRC, including official involvement in and support of scientific exchanges with Western nations, could, unwittingly perhaps, be contributing to the creation of a "new class" of technocrats, a privileged enclave within an already increasingly elitist group of experts.

Second, cohort analysis of China's scientific community has indicated that the particularism of age and the universalism of competence have been complementary standards when applied to older generations of Chinese scientists and academicians. In fact, within scientific circles a direct relationship between these two variables has, as a rule, held for some thirty years, from Liberation through the Cultural Revolution, with professional merit disproportionately found among older cohorts. A possible reversal in this pattern, however, is now on the horizon. Under the impact of technology transfers and related Four Modernizations policies that foster the acquisition of high-level expertise, it is to be expected that within five or ten years China's ablest researchers will be found among the newer cohorts of scientists and engineers. Insofar as middle-aged scientists are bypassed in this process, the age gap between young and old scientists will continue to be nettlesome.

A third interim conclusion is that recent Chinese experiences with technology transfers are contributing to alterations in the cultural sphere. Despite discernible changes in a number of Chinese values such as an openness to new ideas and outside contacts, a staunch nationalism, a longstanding preference for self-reliance, and an abiding aversion to dependence upon foreigners and the importation of their technologies also remain very much in evidence and indicate continuing Chinese ambivalence about technology transfer itself. The reasons for this approach-avoidance stance are several: political, economic, and sociocultural. Reflecting this contradiction, Deng Xiaoping, in a report delivered in March 1980, eschewed any developmental shortcuts for China, underscoring the official line on the importation of technology: "We must also make use of foreign capital and technology and energetically develop foreign trade. However, we must emphasize self-reliance." [61]

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[61] "Text of Deng Report," op. cit.; FBIS: 15.

THE STATUS OF ECONOMICS IN CHINA

By Robert F. Dernberger*

Economists and economics enjoy a dominant position among the social sciences in China's academic and research institutions.[1] All college students are required to take courses in "political economy;" i.e., the study of Marxist economic theories. Economics departments are being recreated and/or expanded throughout China's academic institutions and economic research institutes. By the end of 1979 economic research institutes had been set up in all but 2 of China's 29 autonomous regions and provinces. All social scientists, not just economists, have been called upon to devote their research efforts to promoting the "four modernizations" and to determine the proper means for "readjusting, restructuring, consolidating, and improving" the economy. More than 100,000 economists are said to be working in China's research institutes, universities, and research units attached to ministries and enterprises. Many of these economists were appointed to the more than 100 "fact-finding teams" that have been established to study various economic problems throughout China. These teams prepare reports for the Commission on Economics (the State Council) as inputs in the Commission's decisions on economic reform. In the spring of 1979 a conference of economists met at Wuxi to outline a research plan for 30 specialties or fields. Since that time many new topics have been added to the list.[2] Quite simply, undoubtedly there are more people who both call themselves economists and are actively working in that discipline in China than in the United States. Thus I had no difficulty in meeting and holding discussions with economists during my two visits to China.

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[1] What follows is a revised version of a report prepared on academic training and research in the field of economics, based on two three week visits to the People's Republic of China. The first trip took place in November 1979 in the capacity of a member of the CSCPRC Economics Delegation to the P.R.C. The second was a member of a delegation in the humanities and social sciences sponsored by the American Council of Learned Societies and the Social Science Research Council. My original report was published in Anne F. Thurston and Jason H. Parker, *Humanistic and Social Science Research in China: Recent History and Future Prospects*, published by the Social Science Research Council, New York, in June 1980. Two very important qualifications to this revised version of my report must be made explicit. The rapid pace of change and subsequent developments in China's academic institutions and training and research programs over the past year may well mean that the impressions I obtained during my visits to the P.R.C. are no longer valid or, in the least, must be modified. Secondly, and most important, the following observations and impressions apply specifically to academic training and research in economics—called political economy in China. In addition to those working in the field of academic economics in China, a much larger number are trained as "applied" economists for work in the government's economic bureaucracy. Their training, however, emphasizes the accounting principles and procedures used throughout China's economy and, although their detailed knowledge of how China's economy works may be great, their function is not to analyze the economy by means of traditional Western tools of economic analysis. Finally, a third and much smaller group, which can be termed "technical" economists, focuses on the acquisition and use of techniques that have been developed by Western economists. These include econometrics, forecasting, input-output studies, and linear programming. Involved as they are in research institutes in the fields of operations research, mathematics, computer science, etc., their work will be of much greater interest to (and most compatible with) that done by Western economists. This work, at least that I have seen, is still in a somewhat preliminary stage of development and it is too early to predict the extent to which it will eventually be incorporated into the research and training of academic economists or utilized in the work of those I have called "applied" economists.

[2] I was told that individuals are identified and assigned according to these designated fields. My notes include the following (not a complete list, of course) fields: political economics, the history of political economics, the ancient history of economics, modern economic thought, the history of foreign economics, national economic planning, mathematical planning, mathematical economics, econometrics, statistics, economics of the forces of production, forestry, capital construction, fisheries, commerce, transportation, labor, population, prices, finance, banking, and consumer economics.

Among the purposes of my two visits to the P.R.C. were: the identification of individuals doing research in economics, the topics they were working on, and where they were located. This was aimed at ascertaining the desirability and feasibility of American economists doing research in China, the possibilities for collaborative research, and to determine which were the most promising topics for workshops and research conferences with joint participation by economists from both countries. Unfortunately, this attempt to identify and summarize contemporary work in economics by China's more than 10,000 economists proved a formidable task. I was able to meet with only 41 individual economists from six universities and various research institutes in five social science academies. These discussions would not only be incomplete, but misleading and, at the present time, out-of-date. As a result this report is limited to my general impressions concerning academic training and research in the field of economics in China.[3]

In recent years many visitors to China, as well as the post-Mao leadership itself, emphasize the extent to which the Chinese have fallen behind the standards and techniques of Western social science research. Not only was this gap most evident to me, but I believe several important obstacles, especially in the field of economics, will serve to impede any rapid closing of that gap. The following factors are, I believe, the major reasons for this lack of complementary or ready interface between our economic research interests and those of the Chinese.

(1) At the present time almost every academic institution has an economics department and the academies or associations of social science in the provinces and municipalities include research institutes of economic research. However, many of these are newly created and undergoing the difficulties inherent in rapid expansion. This is not merely the result of disruption during the Cultural Revolution and the scattering of much of the institutional staff to other jobs throughout China. In fact, institutional changes in the 1950s which aimed at the creation of greater specialization in education had already interrupted the economics training and research activities of many universities. For example, during this period the economics department of Zhongshan University (in Guangzhou) was transferred to Wuhan, while the economics department at Nanjing University was sent to Shanghai. As a result both these well-known universities are presently in the process of recreating their economics departments. While, at the present time, the staff at the economics departments and institutions we visited were quite large (over 40 people) several had less than five members. All anticipated a large increase in staff over the near future, and a nationwide exam was being prepared for recruiting qualified candidates who were not then employed in a university or research institution. In other words, the very composition of the centers of eco-

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[3] A list of the specific places I visited and the people I talked with as a member of the CSCPRC Delegation of American Economists can be found in Report of the CSCPRC Economics Delegation to the People's Republic of China, National Academy of Sciences, Washington, D.C., 1980, pp. 46–48. For my trip in January (1980), see Anne F. Thurston and Jason H. Parker, op. cit., pp. 127–29.

nomic training and research are in a period of rapid transition. It may be some time before an understanding of who is doing what and where can be arrived at with some degree of certainty.

Moreover, at each of these institutions one encounters a combination of very senior, better known economists, and an ever growing number of much younger (in the 30s and 40s) scholars.[4] Among these younger academics are those who have gained considerable experience in practical or applied economic work over the past decade or so; that is, those who are being recruited and returned to academic and research institutions. In attempting to identify economists working in particular areas and where they are located, the Chinese suggested that an examination of articles published by individual economists would indicate the topics they were interested in and their research methodology.

This approach, of course, does not really solve the problem. The overwhelming majority of Chinese economists publish in Chinese and, therefore, their work is inaccessible to the most Western economists.[5] However, even those who do have the ability to read Chinese still encounter difficulties. An examination of published available journals in Chinese does not necessarily enable the reader to identify where a particular author is located. I was told that, in theory, the author worked at the university, economics department, or research institute that published the journal, or could be contacted by writing to the particular publishing institution. Furthermore, I was informed that plans were then in the works to begin a listing of author's affiliation "in about a year." Problems of language and affiliation aside, it is the practice of classifying many publications as nei bu ("internal use only") that is perhaps the most serious obstacle to our learning more about who the Chinese economists are, what they are doing, and the results of their work.[6] I was not told, of course, that the Chinese had plans to remove the nei bu classification of these journals in the near future.

The preceding obstacles to determining what are the possible areas of complementary collaboration between the Chinese and ourselves are rather mechanical problems that hopefully can be considerably alleviated with the passage of time. The following obstacles, however, are of a more fundamental nature and cannot be so readily resolved. Keeping in mind the limitations (both in terms of sample and the fact that my trips took place over a year ago) of my "intuitive" impressions, I can only note that they were rather strongly reinforced by conversations with economists I met throughout China.

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[4] This impression is based on truly impressionistic evidence—I did not ask their ages.

[5] While the language barrier is obvious, it is worth pointing out that the Chinese (with regard to both learning English and translating published Western research work into Chinese) are making a considerable effort to reduce the barriers they face. As for Westerners, that barrier is likely to remain in effect until the research work done by Chinese economists begins to appear in English sources. One such journal which has already appeared in Social Sciences in China: A Quarterly Journal in English, published by The Social Sciences Publishing House of China, Jia 158 Gulouxidajie, Beijing, China.

[6] These were not necessarily journals which published "state secrets." Rather they included "work-in-progress," which also are labelled nei bu. Presumably, the reason for this is that the authorities; i.e., those in the academic as well as the political realm, have not yet determined the official line and the authors feel the need for protection; that is, "let a hundred flowers bloom" behind closed doors. An interesting illustration of the problems created by this practice of using the nei bu classification for published work is provided by our attempt to invite a Chinese scholar to come to the University of Michigan as a visiting scholar. Before we could make such an appointment her credentials had to be submitted to the appropriate screening committee in the university. She submitted a lengthy curriculum vitae, but when we received it most of her listed publications had been deleted, including her translations of Western research works. Fortunately, we were able to convince the university she was a knowledgeable scholar who was actively engaged in research and publishing in her field. When she arrived, we figured out that most of her publications had been deleted from her vitae because they had been published in nei bu journals or sources.

My discussion of certain areas of incompatibility between the field of economic studies in the P.R.C. and that of economics as a social science in the West is not presented as a qualitative judgment as to the "state of the arts" of economics as a discipline in China.[7] Rather I seek to explain why the academic training and research in economics in China does not provide us with the basic types of economic analysis of the Chinese economy that are comparable or compatible with those of Western economists. Nor do I mean to imply that these obstacles cannot be overcome; in many cases they can be. I believe that only a serious attempt to understand the existence of these obstacles will provide a means for better appreciating academic training and research in the People's Republic of China by economists in the West.[8]

(2) Differences in training and framework of analyses between Chinese and American economists obviously reflect the well-known contrast between Marxian economics and Western neo-classical and neo-Keynesian economics. I do not believe that any reason exists why followers of one school of economic analysis cannot communicate with and benefit from the work of followers of another school. In fact, collaborative work would be most beneficial to Western research on China's economy. In this effort, however, much of the burden will be on the non-Marxist, Western economist. Considerable publicity has been given to China's programs of sending students abroad to learn Western economics, to their development of courses on Western economics in China, and the invitation of Western economists for lecture tours and teaching assignments. However, this attempt to expose the Chinese economist to Western economics will have a marginal impact. At best it will be concentrated in a few academic and research centers at a relatively high level. In addition, the Chinese are more interested in borrowing Western economic techniques and research tools (such as linear programming and input-output analysis) than the basic principles, methodologies, and objectives of Western economic analysis.[9] Despite these new developments, however, the overwhelming majority of China's economists will probably continue to rely on a pure and traditional Marxian approach to their work.

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[7] A "state of the arts" assessment of economic education and research in China judged from the standards of the economics profession in the United States can be found in Report of the CSCPRC Economics Delegation, op. cit., pp. 33–45. From that point of view I agree with the conclusion provided in that assessment, that "Economic research in China is still at a relatively early stage of development. Most of the economists are advanced in age and have lost touch with the development of the field in the West. . . . If economic research is to advance in a direction other than traditional Marxism-Leninism, serious efforts have to be made to recruit and train technically competent economics students." (pp. 44–45.).

[8] Those social scientists in this country who consider themselves to be "political economists" will not view the following as obstacles to fruitful economic research in China, but rather further evidence of the inadequacies of traditional Western economic theory, research methodology, and research objectives. Thus the following discussion is most relevant to those economists who, due to both training and preference, are typical of those who dominate the membership roster of the American Economics Association.

[9] This attempt has some striking parallels to the Chinese self-strengthening movement in the last half of the nineteenth century; i.e., borrowing Western technology to strengthen the Chinese traditional political and social system.

In this context the current restructuring of college-level training in economics represents a considerable attempt to "get back to the basics" in Marxian economics. For example, in order to concentrate in economics at the undergraduate level at Beijing University, a student is required to take five terms of political economy. The bookstores are filled with multi-volume sets on political economy or interpretations of Marx's "Das Kapital" which match the text requirements for the mandatory (up to three) semesters of study in various departments. Mathematics, statistics, and econometrics courses are being developed and introduced, but as electives rather than required courses. This is also true of new courses on the history of Western economic thought. At the post-graduate level (the equivalent of our graduate training) the majority of the few students who do go on apparently select political economy as their specialty.[10]

Another indication of this return to the basics in Marxian economics in the past few years is the large number of senior and better known economists working on a three-volume encyclopedia of Marxian economics (Volume I—Capitalism, published; Volume II—Imperialism, currently at press; and Volume III—Socialism, now being prepared). An especially clear indication of this desire to return to the fundamentals of Marxian economics is provided by the statement made by economists at Nanjing University. In discussing the dominance of Marxist economic "theory" in the training of economists, I asked how this training helped the students in their work as economic administrators. The answer strengthened my impression of the reemergence of theory (or book learning) and also conveyed a hint of elitism somewhat reminiscent of the traditional characteristics of pre-1949 education in China. Their response was that the purpose was to train students to raise and answer important theoretical questions, such as "the law of value under socialism."[11]

In light of the above, just as I see no reason to believe that Western economists will modify their economic theories to incorporate some elements of Marxian analysis, neither do I see any evidence of Chinese economists modifying the principles of Marxian economics to become "more like us."

(3) A second major difference between the typical Chinese and American trained economist is in their research work. A large portion of the economists I met were doing research and I was told of various research projects everywhere I went in China. As I have already noted, the major concern of Chinese economists is with Marxist economic theory. Research in this area concentrated on the search for Marxist "economic laws" in the socialist period. This involved the study of basic Marxist texts, including those of Stalin, and the search for a set of theoretical guidelines to fit China's particular institutional setting

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[10] Another post-graduate specialty which appears to be "popular" is foreign economies, not foreign economics.

[11] This distinction between academic training and research in economic theory and the applied economics within the bureaucratic administration of China's economy is made clear in a recent article by Xue Muqiao, one of China's highest level economic administrators who does not, however, have formal training in economics. After reviewing China's current economic problems and his suggestions regarding how to solve them, he explicitly mentions those who are investigating these problems from the standpoint of socialist economic theory in an attempt to determine the economic laws of socialism. Recognizing the role and need for theoretical research, Xue argues that he is concerned with practical suggestions. See Xue Muqiao, "Adjust the National Economy and Promote Overall Balance." In Economic Research (in Chinese), No. 2 (Feb. 20, 1981), pp. 25–31.

and level of development. The results of this could, of course, make a significant contribution to Marxist economics. This could, potentially, be of great interest to American students of Marxist economic thought, although American scholars in general might not consider it of very compelling interest. A second category of research falls under the label of "a survey of the literature;" that is, the acquiring of knowledge that is already available in first-rate university libraries in the United States. Hence there is interest in the history of Chinese economic thought, the history of Western economic thought, the history of socialist economic thought, and historical and contemporary developments in foreign countries. Courses on each of these topics have been introduced into the curriculum and post-graduates can now specialize in these fields, depending of the particular university. (As is the case with industry, China's educational institutions hope to benefit from specialization in the division of labor, with each university specializing in particular fields. All specialize in political economy, however). Various research institutes have been set up to carry out "research" on these topics as well.

The Western economist interested in China's economy is naturally most interested in the applied research being done by the Chinese on their own economy. A single course on the "national" economy has been included in the economics curriculum of most economics departments, and a limited number of research institutes devoted exclusively to research on the national economy have been created. Moreover, a great many of China's economists have been engaged in applied research on economic developments in China. As mentioned earlier, economists have been asked to help promote the "four modernizations." Many are doing so by investigating some aspect of China's current economic problems. Nonetheless, on the basis of my inquiries about this research, I believe much of it can best be described as "fact finding." In the absence of systematically collected and published economic data, this type of research is required for national level and local policy decision making. Thus it is consistent with the more traditional approach of economic analyses in China prior to 1949.

According to what I was told, the system of collecting local economic data and transmitting it to the central government level occurs through the political administrative network. This system, which had replaced the State Statistical Bureau during the Cultural Revolution, was to continue in the future. At the central government level the recreated State Statistical Bureau is in the process of creating offices and assigning its own statistical workers at lower levels in order to provide a parallel check on the economic data being reported to higher levels. Sample checks indicate the statistics being generated by the existing political channels have an average error of plus or minus two percent. However, economists I talked to in the academic and research institutions claimed that although they could request statistics from the Ministries and State Statistical Bureau relevant to a particular Bureau topic they were researching, they had no special access to unpublished statistics. Moreover, these economists were favorably impressed with the estimates and calculations Western economists had made on the basis of the few data that were published by the Chinese.[12] Some even thanked us for visiting China and meeting with higher level economists in Beijing who would give us economic data that often was not available to them. In general the economists I met believed the economic data available gave them a good picture of aggregate trends, but were deficient with respect to the micro-level picture of the economy. They expressed a need to do field research and collect their own micro-level data.

The results of this rather wide-spread and relatively basic level data collection or "fact finding" research (to the extent that it is made available to Western economists) will prove to be very helpful to those desiring to do research on China's economy.[13] As described to me, however, what is noticeably lacking in this "fact finding" research is any meaningful attempt to analyze cause and effect; i.e., these research efforts concentrate on trying to determine what happened without proceeding to an analysis of why. Part of this problem is undoubtedly due to the lack of the necessary tools of statistical analysis and econometrics that Western economists have developed for this purpose. The national call to "seek truth from facts" often seems to have resulted in little more than the ex-post rationalization of the facts, on the basis of a wide range of economic, social, and political variables. A minimal attempt is made to hold anything constant. At the present time some Chinese economists are expressing an interest in learning Western statistical and econometric techniques. I seriously doubt, however, that these will be used to determine the rationality or optimality of particular uses of resources or inputs, the shadow prices of those inputs, the rates of return of the alternative uses of those inputs, the real costs of the output, the implicit prices of outputs; etc. While such projects would have little problem with describing how something happened, little attempt is made to evaluate whether it made economic sense.

This leads me to a final major distinction between the research done by Chinese and Western economists: the purpose of the research being done. While most economic research in the United States lies within the general area of "positive" economics, most economic research by Chinese economists has a very "normative" theme. The dominant form of economic research involves, for example, the search for evidence to show how progress is being made toward implementing the objectives of the "four modernizations," or to demonstrate the effectiveness of a particular "experiment" or policy. For instance, members of the senior class at Fudan University in Shanghai collectively wrote a paper on the problem of unemployed youth in that city—specifically drawing up models of how to organize collectives. In other words, such issues as whether or not the oganization of urban collectives is a rational way to solve the problem of urban unemployment (that is, is it a rational use of unemployed labor, whether or not a set of "rational" prices would indicate that a different allocation of labor would be more sensible, or whether this policy of forming urban collectives would even solve the problem of urban unemployment) are all questions that must wait until the policy itself is changed; i.e., when policy makers desire evidence to show why the policy doesn't work and why it needs to be changed.

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[12] The Chinese have published a translation of both the 1975 Joint Economic Committee collection of papers on China's economy, China : A Reassessment of the Economy and the 1978 volume Chinese Economy Post-Mao. A friend in the Shanghai Academy of Social Sciences wrote me to request a copy of the 1978 volume, because of the excess demand for the library's copy. In attempt to meet this demand, in the first printing of the Chinese translation some 27,000 copies were issued. Needless to say, this was a considerably larger number of copies than that for the original volume in English, printed by the U.S. Government Printing Office.

[13] For example, while in China I was told they were collecting a large sample for estimating the class size distribution on income. Articles in the Chinese press over the past year have presented statistics which must be based on these estimates. The major findings for wage and salary earners (sample size of 86,955 families) were released by the New China News Agency on Dec. 30, 1980. Only over-all averages yielded by a sample of 10,282 commune families were released (NCNC, Jan. 2, 1981), but statistics cited in many articles over the past year must come from a complete coverage data set for the average collective per capita income for all the basic units of production (i.e., brigades or teams) in China's rural sector.

My impressions have been presented here with more certainty than is warranted by my two brief trips to the People's Republic of China. Therefore it is necessary to qualify them by mentioning several important exceptions that I also observed. I did, in fact, meet some economists who differed considerably from those I have described as typical. For example, while holding a discussion with representatives from the economics faculty of Sichuan University, we were joined by a young economist who had just come from teaching a class. Actively engaged in field research, his discussion of economic problems in the countryside was much more compatible with Western concepts of applied economic research than of normative, ex-post rationalizations, descriptive analyses of current programs, or discussions of leading issues in the theory of political economy. The same was true of the economist-interpreter assigned to me by the Shanghai Academy of Social Sciences. Having worked as director of the Planning Office in an electronics enterprise during the previous ten years, he had applied for membership in and was assigned to the Academy in 1979. Working mainly as a translator-interpreter, he had first-hand knowledge of China's economy and was able to discuss economic concepts and problems in terms easily understood by a non-Marxist, Western economist.

The same diversity is also undoubtedly true of the research being done. Such projects as the reported attempts to compute national income accounts, to compile input utilization rates per unit of output, changes in average productivities, etc., could be mentioned as hopeful signs of this type of research. This kind of fact finding and data collection is relevant to the research interests and methodology of Western economists who can usefully employ it in their analyses of economic developments in any country.

It is also important to note that my impressions are based on visits to several major academic institutions and major academic research institutions. I did not visit with economists working in the ministries, or in institutes in the Chinese Academy of Sciences, or at schools under the ministries active in training economists to work in the government, or at the research institutes run by the ministries, the People's Bank of China, the Planning Commission, or the Commission on Economics. Quite simply, I had little contact with those actually working in economic administration or policy implementation. Some of my colleagues in the Economics Delegation did visit with representatives from various research institutes, organizations, and academic departments in the sciences, where work was being done in the field of mathematical economics, statistics, operations research, input-output analysis, etc. They reported finding some very knowledgeable "economists" doing very interesting work in these areas. Some possible reasons that modern analytical techniques are more commonly used in the natural as opposed to social sciences are that scientists more often possess the prerequisite mathematical skills, are not hindered by the politico-economic theoretical orientation of economics as a social science, and have access to the scarce computers.[14]

Every major city I visited contained a college of economics and finance, run by the Ministry of Finance. Unfortunately, I did not visit one of these schools, but my impression is that they offered courses in what we would call business economics. The contents of course related texts I found in the bookstores included explanations of the accounting methods used to estimate depreciation rates, circulating capital, etc. Furthermore, many economic units, especially large enterprises, also run schools for training their own economists in statistical, planning, and accounting work.

Judged from the standards, methods, and objectives of contemporary Western economics, my impressions concerning the current state of academic training and research in the field of economics in the P.R.C. leads one to a very pessimistic conclusion. This gap between the state of the arts in the field of economics between the two countries may be somewhat alleviated in the future. This can be achieved by the sending of Chinese students to study in the United States and other Western countries and by the sending of Western economists to China to give and hold seminars or joint conferences. It can also be furthered by the revival of imports of Western journals and books in the field of economics. However, the small-scale of these activities and the limited extent to which they are grafted into the main stream of academic training and research in economics in China will, I believe, do little to close the existing gap in the near future. Even assuming the present policies aimed toward closing that gap continue over the foreseeable future, there will be a considerable gestation period before these initial and limited efforts to catch up will pay off.

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[14] The Operations Research Division is part of the Institute of Mathematics, the Chinese Academy of Sciences. Members of this division prepared an input-output table for China's economy based on data from 1974–76. It is reported that the Institute of Economics, in the Chinese Academy of Social Sciences, did not participate in this effort because the Institute considered mathematical economics to be contradictory to Marxism-Leninism. (There appeared to be no knowledge of Michio Morishima's mathematical treatment of Marxian economics in China). Nonetheless, a preparatory group for the establishment of an Institute of Quantitative Economics has been formed within the Chinese Academy of Social Sciences. Chen Sikang and Shei Shenwei of the Operations Research Division of the Institute of Mathematics, the Academy of Science, presented a paper entitled "A Non-Linear Input-Output Model in Physical Units and Its Application in China," to the seventh International Conference on Input-Output Techniques, Innsbruck, Austria, April 1979, which includes the basic framework of the input-output table referred to above. For the basic framework of an econometric model developed for China's economy, see "Econometric Model of Chinese Economy for Use in Planning," in Economic Research (in Chinese), No. 2 (1980). In the summer of 1980 four prominent American econometricians were invited to China by the Chinese Academy of Social Sciences to hold a month long seminar on econometrics in which over 100 Chinese from a variety of institutions participated.

4. MILITARY

CHINESE MILITARY MODERNIZATION IN THE 1980's

By Thomas W. Robinson*

1. COMPONENTS OF CHINA'S MILITARY MODERNIZATION

Since the deaths of Mao Zedong and Zhou Enlai in 1976 and the ensuing concentration on the four modernizations, increased attention has been paid to whether, and to what extent, China will be able, or wish, to bring its military machine and its military strategy more closely in line with that of "advanced" countries. The term usually applied to this question is "military modernization," a broad concept encompassing a number of discrete but hardly unusual categories, which are outlined below. The term possesses the advantage of pointing to how changes in military investments are related to the Chinese Communist Party's overall program of general economic recovery after the Cultural Revolution and how military affairs fits into the Party's plans for the next two-three decades.[1] Extending the meaning of the concept and relating it to the general state of China's political economy has the additional advantage of drawing attention away from exclusive emphasis on one component of Chinese military affairs, "people's war," that overworked and by now sterile term to which both Chinese practitioners and Western analysts were slave for the last four decades.[2] "People's war" as a strategy and a useful concept continues, but it is no longer the umbrella term for understanding Chinese military issues. Indeed, it has been modified by the Chinese themselves, under the rubric "people's war under modern conditions."[3]

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[1] For some previous work on this subject, see, inter alia, Sydney Jammes, "The Chinese Defense Burden, 1965–1974," in Joint Economic Committee, 94th U.S. Congress, "China: A Reappeasement of the Economy" (Washington: Government Printing Office, 1975), pp. 459–466; Paul H. B. Godwin, "China's Defense Dilemma: The Modernization Crisis of 1976 and 1977," Contemporary China, Fall, 1978, pp. 63–85; Francis J. Romance, "Modernization of China's Armed Forces," Asian Survey, March 1980, pp. 298–310; Angus M. Fraser, "Military Modernization in China," Problems of Communism, September–December 1979, pp. 34–49; David L. Shambaugh, "China's Quest for Military Modernization," Asian Affairs, May–June 1979, pp. 295–309; and Edward N. Luttwak, "Problems of Military Modernization for Mainland China," Issues and Studies, July 1978, pp. 53–65.

[2] The initial task of analyzing people's war into its constituent elements was done in Jack Harris' excellent article "Enduring Chinese Dimensions in Peking's Military Policy and Doctrine," Issues and Studies, July, 1979, pp. 77–88.

[3] The term was authoritatively mentioned by the "Theoretical Group of the National Defense Scientific and Technological Commission, in Foreign Broadcast Information Service (FBIS), Daily Report—People's Republic of China (PRC), Jan. 23, 1978, pp. E1–E6, and was given sanction by the then Defense Minister, Xu Xiangqian, in his Army Day article "Heighten Our Vigilance and Get Prepared to Fight a War," Peking Review, no. 32 (Aug. 11, 1978), pp. 5–11.

There are at least five components of Chinese "military modernization,"[4] several of which are quite broad themselves and can be further subdivided. First, there is component modernization, the bringing into line with other "modern" armies the equipment; the training, education, and organization; and the command, control, and communication of the three services of the People's Liberation Army. Commensurate with this, second, is manpower modernization: variations in force size and force composition (including different balances among the services) and changes in the age structure of the Army's leadership and ranks at every level. These two components have to do with how the Chinese military appears, in the material and organizational sense. How it comports itself on the battlefield and how it intends to meet and defeat the enemy relates to the third component: doctrinal modernization, both strategic (e.g., the people's war concept itself and the manner in which the military deploys and maneuvers generally) and tactical (the manner in which the military employs its men and weaponry in local situations, including, for instance, how it uses combined arms and combined forces tactics). These three components determine how the Chinese wage war in the physical sense.

The remaining two components concern the material and societal basis for that exercise. The material component concerns, for the most part, the physical support Chinese society provides the Army. Since Mao's passing, this has been reduced principally to the degree to which the industrial base is able to provide the military with equipment thought necessary to face the enemy on relatively equal terms. But it is also related to such issues as the ability of society to provide the Army with a steady flow of well-prepared recruits, the logistical base, and the capability of the country as a whole to feed, house, and clothe the military before and during a conflict. This component thus ties the question of military modernization to that of the overall "four modernizations" of China.[5] The final element is how the military fits into Chinese society in peacetime, the societal component. This comprises three traditional topics: Army-Party relations; the issue of professionalization (including the questions of restoration of ranks and medals, and whether and to what extent the military should participate in such non-military activities as production and education); and how much special status (i.e., privileges) the military should have.

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[4] The term is hardly a new one, having been used by the Chinese since at least the Korean War. Moreover, it is a process practically synonymous with the history of the People's Liberation Army. See, in that regard, John Gittings, "The Role of the Army" (London: Oxford University Press, 1967); Ying-mao Kau, "The People's Liberation Army and China's Nation-Building" (White Plains, New York: International Arts and Science Press, 1973); William W. Whitson, "The Chinese High Command" (New York: Praeger, 1973); Harvey Nelson, "The Chinese Military System," revised edition (Boulder, Colo.: Westview Press, 1981); and Paul H. B. Godwin, "Doctrine Strategy, and Ethic: The Modernization of the Chinese People's Liberation Army" (Maxwell Air Force Base: Air University, 1977).

[5] The above set of distinctions owes much to the author's conversation with Dr. Frank Romance, U.S. Defense Intelligence Agency.

The Chinese often seem to use "modernization" in a restricted sense, equivalent to economic/technological progress. This is only one aspect of an integrated process extending over a long period and including major changes in the political, cultural, social, and educational life of the country as well as economic changes. Urbanization, literacy, democratization, bureaucratization, the demographic transition, and modified socialization are some of the factors associated with overall "modernization," not all of which are the mere products of industrialization. Almost all of them, however, are present in more or less full-blown form in China, and it is the complex interrelationships of that set with efforts to industrialize that will determine in the end the degree of success China will have in economic modernization. The Chinese leadership seems aware of this intricacy—witness the latter-day stress on education and birth control—but as yet lacks a sophisticated understanding of the complex requirements of overall progress.

2. The Requirements Approach

The task of any Chinese military planner must be to organize these components to support the basic goal of defending the country while at the same time taking account of the environment imposed on him. In the short run, of course, he must yield to that environment as given. Thus, such obviously relevant variables as China's population, geographic configuration, historical experience, and lack of a high-technology industrial base must be accepted as they are.[6] Other, more specific factors such as the Maoist theory of people's war, the configuration of the People's Liberation Army as a result of its revolutionary and post-revolutionary experience, the harm inflicted on China stemming from the Cultural Revolution, and the nature of the military threat posed by the Soviet Union must also be dealt with as constants, at least for the while.[7]

This immediately imposes an ordering to the components of military modernization. Non-equipment modernization must take precedence over hardware improvements because the latter can be brought into quantity deployment only slowly and at great cost. Since manpower modernization is relatively less subject to physical and economic constraints,[8] it can be experimented with and worked upon more easily than technology-laden upgrading of weapons systems. With regard to doctrinal changes, the people's war concept can be analyzed into its many parts, each of which can then be inspected for congruence with the demands of the changed conditions imposed by the Soviet[9] military challenge. Because the technological and industrial base can be improved by internal efforts only slowly, the traditional reluctance to become entangled with foreign countries and companies for supply of capital, technology, and training will have to be relaxed, if only temporarily. And because the damages wreaked by the Cultural Revolution to Chinese education and industry require that prime attention be paid to remedial work in these areas,[10] making up for the sins of the immediate past as well as overcoming the longer-term problems of China's relative backwardness must take precedence over military modernization. Thus, in general, the military must take a back seat to agricultural, industrial, and scientific-technological progress.

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[6] Obviously a country of a billion people, packed into a limited geographic area, possessed of an ancient and proud heritage, but faced with a technologically superior enemy must cleave to one or another variant of "people's war." Change those basic variables and Chinese military strategy will also change.

[7] The operative question is: how long will they be constants? The answer varies according to what factor one considers. The Soviet threat is a relative matter and could disappear in short order with a change in Soviet policy. The PLA's configuration will change with overall modernization, i.e., only slowly and probably not significantly for most of the 1980s. The Cultural Revolution's effects will not be definitively overcome for a generation—not until the close of the century.

If the experience of other countries is any guide, major changes in military configuration—strategy, equipment, societal role, etc.—come only after about a half century of concerted change in determining variables. The American military switched from an attrition to an annihilation strategy only after 75 years of independence. The Japanese army took forty years to evolve from Samurai swordsmen to European-style military, while the German military modernized itself during the half century from 1816 to 1866.

Perhaps modernization has speeded up in the twentieth century; the Chinese Army took only 22 years (1927 to 1949) to attain its "modern" form. But that was due to the forcing house of constant combat. With the high rate of change imposed by the requirements of technology, modernizating military forces may find their time horizons stretching out rather than contracting. A half century is therefore still not a bad estimate. Presuming that, after 1950, about 15 years (1950–1965) was spent in military modernization, which began again in 1976, the Chinese military could look to becoming a thorough modernized force only in the first decade of the 21st century.

[8] The 4 million plus PLA is composed largely of low-paid highly motivated foot soldiers, whose absence from the village—until recently—has conferred benefits on the local and national economies. Given the continued abundance of such personnel, manpower can be treated as a fungible resource. And given the large number of units making up such a members-laden army, experiments involving variations in unit size, composition, and tactics are relatively easy to carry out. Aside from one article of which the author is aware, there is no publically available work on the economies of the Chinese military. The exception is Bernhard Grossmann. "The People's Liberation Army: Economic Aspects," in "The Role of the People's Liberation Army," vol. 1 of Proceedings of a Conference on the PLA. Centre d'Etude du Sud-est et de l'Extreme Orient, Brussels, June 1, 1969.

These are some examples of the implications that flow from matching, in a rational manner, the requirements of military modernization. understood in the broadest sense, with the constraints imposed by the Chinese environment, also understood in the broadest sense. This is what we term the "requirements" approach. And the examples just quoted are some of changes that have actually come about. mostly since Mao's demise. One reason for these changes, therefore, is that they represent a rational response to the demands of working out a credible defense of China under trying domestic and threatening international circumstances. It begs the question, however, whether there exist alternative paths to military modernization equally as efficacious as that presently in train or perhaps eventually superior. It also leads us to ask how the Chinese leadership came to adopt the present program and what, in reasonable detail, it comprises.

3. EVOLUTION OF THE CHINESE MILITARY SINCE 1949

A. 1949–69

Let us address the second query first. The course adopted by the post-Maoist Chinese leadership traces its roots back to before Mao's death. in some regard to the first period of Chinese military modernization following the Korean War. Military modernization in China is, in fact, an on-again off-again story (mostly, as it turns out, off-again).[11] In general, military modernization is another instance of the overall determination of developments in specific areas by two factors: the details of intranecine leadership politics and, to a lesser extent, the requirements of defense and foreign policy. It has been Mao Zedong who, in general, set the direction and pace of Chinese military modernization, even though he was beset with demands from the Army leadership and had at times to give way to the requirements of addressing the foreign threat. From the Korean War down to the late 1950s, Mao had to give due weight to the "objective requirements" of national defense, because in that era the United States was considered the principal threat and because the Soviet Union, China's protector, was not yet able to guarantee the country's borders and cities against American attack.[12] Because this was also an era of reasonable political harmony at home, the Chinese Army modernized itself at a rapid pace and with minimal interference from the political sector.

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[9] Since the early 1970's, the Chinese have had to think primarily in terms of defense against Soviet land attack. But they have, seemingly, not thought carefully about a Russian nuclear offensive alone. unaccompanied by a ground attack, or of limited ground offensive in certain border areas. Moreover, until the late 1970's, Peking did not eliminate the possibility of having to face the United States as well as the Soviet Union. Further, the rise of the Vietnamese challenge to Chinese security after 1976 and its military link with Moscow greatly complicated China's defense. And although India, Japan, and Taiwan are not now security threats, they could well be so in the foreseeable future. China has always sought, perforce, to simplify its defense by reducing it to one threat, in the 1950's the United States and in the 1970's the Soviet Union. It is doubtful whether such "reductionism" will last out the century or even the 1980's.

[10] For an entré into the massive literature, Chinese and Western, on this matter, see the sources cited in the notes to part I, "China's Modernization Program," of A. Doak Barnett "China's Economy in Global Perspective" (The Brookings Institute, 1981), pp. 586–628.

[11] Aside from the sources cited in note 4, see also: Samuel B. Griffith, "The Chinese People's Liberation Army" (London: Oxford University Press, 1967); Harlan Jencks "From Muskets to Missiles" (Boulder, Colorado: Westview Press, 1982): Ellis Joffe, "Party and Army: Professionalism and Political Control in the Chinese Officer Corps" (Cambridge. Mass.: Harvard University Press, 1967): and William W. Whitson (ed.), "The Military and Political Power in China in the 1970's" (New York: Praeger, 1972).

That ended in 1959 and 1960, because internal and external conditions changed nearly simultaneously, and significantly. Internally, a Great Leap Forward-induced challenge to Mao's pre-eminence was launched by the Defense Minister, Peng Dehuai. Mao handily overcame Peng personally and went on to appoint his own personal follower, Lin Biao, as Peng's successor.[13] The new Defense Minister gradually undid some of Peng's reforms—abolishing ranks, repoliticizing the military, sending it back to its prior closely integrated position in society, and re-emphasizing its people's war origins and practices.[14] This could not go too far, however, since the external situation had also changed. The Soviet Union in 1960 began to withdraw its protective mantel from around China, leaving the country exposed to possible American (or, as the Chinese feared, American-Nationalist) attack. Only the emerging American involvement in Vietnam caused the Chinese leadership to relax their concern somewhat, and that only after a tacit Sino-American agreement over Vietnam had been arranged in the middle-1960s. Meanwhile, weapons modernization proceeded apace on the basis of Chinese production of Soviet-style equipment and of the explosion, in 1964, of China's first nuclear weapons device.

The Cultural Revolution, together with the drawing off of American attention almost totally to Southeast Asia, led China even further away from strict attention to the requirement of defense and even further towards politicization of the military. Material and social resources devoted to defense declined and the ability of the Army to defend China's territory correspondingly dropped.[15] Mao in effect took a calculated risk that neither the Americans nor the Russians would attack or would build up a force that, by threatening to attack, could impose unhappy choices in Chinese domestic developments and foreign policies. Unfortunately, Mao bet incorrectly on the Soviet propensity, for the Russians did begin to build up a military machine that, by the late 1960s, threatened Chinese territory and required Beijing to make unpalatable decisions. The result of the border clashes that year and the subsequent Soviet political-military campaign of intimidation was that the Cultural Revolution had to be wound down [16] and Chinese foreign policy had to be changed markedly.

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[12] For China's defense policy during the 1950's, see Raymond L. Garthoff (ed.), "Sino-Soviet Military Relations" (New York: Praeger, 1966); Roderick MacFarquhar (ed.), "Sino-American Relations, 1949–71" (New York: Praeger, 1972), pp. 59–181; and Alice Langley Hsieh, "Communist China's Strategy in the Nuclear Era" (Englewood-Cliffs, N.J.: Prentice-Hall, 1962). In light of subsequent events and data, it should now be possible to write a more comprehensive treatment of early Chinese Communist defense policy.

[13] On Peng's demise, see Union Research Institute, "The Case of P'eng Teh-huai" (Hong Kong: Union Research Institute, 1968); David A. Charles (pseud.), "The Dismissal of Marshall P'eng Teh-huai," The China Quarterly, No. 8 (October-December, 1961), pp. 63–76; and Roderick MacFarquhar, "High Noon at Lushan," m.s., 1981.

[14] Thomas W. Robinson, "A Politico-Military Biography in Lin Piao, Part II, 1950–1971," ms. 1971, pp 24–43.

[15] The Jammes Study (fn. 1) and the Nelson book (fn. 4) indicate that military investment declined during the first year of the Cultural Revolution, recovered to the 1966 level by the end of 1967, and moved modestly upward by the beginning of 1969. The major growth was in the 1969–1971 period, coinciding with the greatest danger, relatively speaking, from the Soviet Union, with the necessity to direct the PLA to suppress internal disorders, and with the disarray attendant upon the Lin Biao affair. Nelsen clearly shows the movement of major army units south from the Soviet border and toward the strife-laden cities. By 1969, the PLA's capability to defend the country had thus dropped considerably, especially in light of the concomitant Soviet military buildup along its side of the border.

B. 1969–76

Now Mao had to run for cover. He did so principally by bringing in the Americans as a makeweight to the Russians. This took time, since the Vietnam conflict was at its height, but by 1972 the Kissinger-Nixon visits and the Shanghai Communique had largely accomplished this goal.[17] Domestically, Mao and Lin Biao saw that the military procurement budget was increased substantially, that forces were re-deployed away from the Fujian Straits region back toward the Sino-Soviet frontier, that militia training was expanded, and that an expensive tunnel-digging civil defense campaign was undertaken.[18] Significantly, people's war as the chosen Chinese strategy was re-emphasized, even though this would mean the giving up of border areas or even such important regions as the industrial Northeast in the first phases of a Soviet offensive.[19] In effect, the Chinese were trusting that the combination of the promised changes in the international strategic environment, the re-institution of political order at home, the protracted and destructive nature of people's war, and the certainty that Soviet invasion would result in nuclear destruction of at least some Soviet cities would deter the Red Army.

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[16] This is not to assert that the Cultural Revolution reversed course solely because of the Soviet threat. The major reasons were internal: popular disorders, production declines, and political disarray. For this period, see Jacques Guillermaz, "The Chinese Communist Party in Power, 1949–1976" (Boulder, Colorado: Westview, 1976), pp. 359–470; Stanley Karnow, "Mao and China" (New York: Viking, 1972); Thomas W. Robinson (ed.), "The Cultural Revolution in China" (Berkeley: University of California Press, 1972); and Jürgen Domes, "China After the Cultural Revolution: Politics Between Two Party Congresses" (Berkeley: University of California Press, 1977).

[17] These events may be followed in Henry Kissinger, "White House Years" (Boston: Little, Brown, 1979), pp. 163–194 and 684–787; Robert G. Sutter, "China-Watch: Sino-American Reconciliation" (Baltimore: Johns Hopkins University Press, 1979), Gene T Hsiao (ed.), "Sino-American Detente and Its Policy Implications" (New York: Praeger, 1974); Harold E. Hinton, "Three and a Half Powers: The New Balance in Asia" (Bloomington: Indiana University Press, 1975), pp. 125–148 and 184–208; William P. Barnds (ed.), "China and America: The Search for a New Relationship" (New York: New York University Press, 1977); A. Doak Barnett, "China and the Major Powers in East Asia" (Washington: The Brookings Institution, 1977), pp. 153–252; and Donald G. Hellmann (ed.), "China and Japan: A New Balance of Power" (Lexington, Mass.: D. C. Health, 1976), pp. 159–296.

[18] Chinese military redeployments can be traced in "The Military Balance" (London: International Institute for Strategic Studies, yearly). Generally, after initial confusion in 1969 and an attempt to reposition main force units withdrawn from the Northeast for Cultural Revolution duties, the main effort went into upgrading equipment, constructing defense fortifications, training the militia, and putting soldiers back into line units Needless to say, this took much time and effort—particularly in view of the aftermath of the Lin Biao affair and the destructive effects of the Cultural Revolution (still ongoing in the early 1970s). The ups and downs of the militia, and its relation to the people's war strategy, are ably treated in Thomas C. Roberts, "Chinese Military Modernization and the Doctrine of People's War" (Washington, D.C.: National Defense University Research Directorate, 1981 draft). Civil defense and the tunnel diggings campaign are poorly studied. Many foreigners have been taken on tours of the complex in Beijing and other cities. The Chinese have published a civil defense manual, translated as "Chinese Civil Defense" (Springfield, Va.: National Technical Information Service, 1977).

[19] The controversy within the PLA and between Army and Party over what strategy to adopt against the Soviet Union took the forms of debate between advocates of "luring deep" and those favoring meeting the Russians "at the gates" or beyond. This controversy, central to the form which people's war would take, is well covered by Nelson, "The Chinese Military System" and Roberts, "Chinese Military Modernization and the Doctrine of People's War." All rounds have been won, down to 1981, by those favoring the traditional luring deep strategy. Until China procures a sufficient quantity of modern weaponry to confront the Russians successfully at the border, it is unlikely to be otherwise.

This combination was only partially changed upon Lin's demise in late 1971. The major variation was a rather percipitous decline in the military budget, as the Party sought to evict the military from the center stage of the political arena.[20] On the other hand, the American component was pursued even more openly and the people's war threat was bally-hooed even more loudly. But two unforeseen changes also took place. First, the political situation did not calm down as quickly or as completely as the Maoist leadership had hoped. In fact, due to the pertubations of the late Maoist succession and the concomitant struggle for power among various factions, political disorder increased and overall military effectiveness was negatively affected.[21] This lasted practically down to Mao's last year, enormously injuring the societal and industrial base of military preparedness. Objectively speaking, the People's Liberation Army was unable to defend the country from the Soviets; even Beijing was open to Russian conquest.

The second change was subjective. The Chinese leadership not only admitted to itself the seriousness of the situation and resolved to take remedial action but also realized that such action would take a lot of effort over a lengthy period. Zhou Enlai's proposal that the Party and the country should center on the four modernizations;[22] that they should take whatever time (i.e., several decades) was required to make China, finally, into a strong, modern, and still socialist country; and that they should make whatever sacrifices, domestically and internationally, to assure their success, was the concrete expression of those realizations. Zhou in effect said that China could bluff only so long and that the time for programmatic changes was at hand.

Unfortunately, several more years were to pass before the Chinese leadership was able to find the degree of unity to put the overall modernization program into high gear. It took Mao's own death, the scares provided by the several natural disasters of 1976, and finally the removal of the Gang of Four [23] to set the domestic situation reasonably right. Meanwhile, it had finally become obvious to the Party as well as the Army that no great good would come merely from continuing to produce a high volume of obsolete equipment. The results of the 1972 Middle East conflict (where high technology weaponry and a well-developed logistical base were critical to the outcome) and the increasingly destructive nature of the Vietnam War (where the Americans used not only massive quantities of airpower but also introduced a whole family of precision guided munitions) greatly influenced the decision not to resort to quantity production of older weaponry.[24] Instead, the military and the political leadership both admitted that several weapons revolutions had arrived and that China could well be left behind. When the additional realization came that the new systems were very expensive financially, that China could not produce them in any case, and that they were not necessarily compatible with a people's war strategy, the conclusion could no longer be avoided that the military had better mark time, thoroughly investigate the new situation, and not waste money on mere replication of old systems.

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[20] Jammes, "The Chinese Defense Burden," op. cit., fn. 1. The budget declined for several reasons: declining costs of Cultural Revolution administration as the Army returned to the barracks; lower procurement costs attendant upon the realization that Chinese equipment was obsolete; confusion in Party-Army relations following the Lin Biao incident; and a decision to put more funds into research and development of strategic systems.

[21] Political developments in the 1972–76 "Gang of Four" period may be followed in the Asian Survey yearly review articles, January; the Current History yearly review articles, September; and the Far Eastern Economic Review writings of Leo Goodstadt. See also Franz Michael, "China After the Cultural Revolution: The Unresolved Succession Crisis," Orbis, Summer 1973, pp. 315–333; Michael Oksenberg and Steven Goldstein, "The Chinese Political Spectrum," Problems of Communism, March–April, 1974, pp. 1–13; Edward E. Rice, "The Campaign to Criticize Lin Piao and Confucius," Pacific Community, October 1974, pp. 94–106; Harry Harding, "Political Trends in China Since the Cultural Revolution," Annals of the American Academy of Political and Social Sciences, July 1972, pp. 67–77; Kenneth Lieberthal, "China in 1975: The Internal Political Scene," Problems of Communism, May–June, 1975, pp. 1–11; Parris Chang, "Mao's Last Stand?", Problems of Communism, July–August, 1976, pp. 1–17; and Parris Chang, "The Passing of the Maoist Era," Asian Survey, November 1976, pp. 997–1011.

For studies of the military during this period, see: Parris Chang, "China's Military," Current History, September 1974, pp. 101–105ff; Parris Chang, "The Changing Patterns of Military Participation in Chinese Politics," Orbis, Fall 1972, pp. 780–802; Ellis Joffe, "The Chinese Army After the Cultural Revolution: The Effects of Intervention," The China Quarterly June-September, 1973, pp. 450–477; Chia Young-fa, "The Impact of the Lin Piao Affair on the People's Liberation Army," in Lien Chan (ed.), "Proceedings of the Third Sino-American Conference on Mainland China" (Taipei: Institute of International Relations, 1974), pp. 372–404; Jürgen Domes, "The Relationship Between Party, Army, and Government in Communist China," in "Proceedings of the Fifth Sino-American Conference on Mainland China" (Taipei: Institute of International Relations, 1976), pp. 183–211; and Leo Y. Liu, "The Relationship Between the Army and the Party in China During the Transitional Period from 1967–1976," Asian Studies, December 1976, pp. 56–81.

[22] Chou En-lai, "Report on the Work of the Government," Peking Review, Jan. 24, 1975, pp. 21–25.

Finally, the general implications of the damage of the Cultural Revolution came home to Mao's successors. The most important economic consequence was that China would have to continue the post-Great Leap emphasis on agriculture and light industry and could not produce the new weapons systems without a thorough societal grounding in the science and technology at its base. The resultant financial, educational, and manpower constraints meant that upgrading the military had to come last among the four modernizations. That would take a long time.

The iron logic of Chinese modernization was visible in outline in 1972 and was set forth in Central Directive 18 of 1975.[25] This document definitively withdrew the Army from the political arena and instructed military leaders to concentrate on training and defense. It also told them not to expect much very soon from the economy by way of new systems. Indeed, experience since that time with the British Spey engine deal drove home the point: it proved impossible to duplicate, easily, quickly, and in quantity, high level jet engine technology[26] and thus impossible in the short to medium run to produce a first-line high performance jet fighter or bomber to confront the Russians. The story since then has been much the same: much interest in Western technology, much window shopping, but few purchases.[27] The reasons are also the same: very high expense, very great difficulty of production, and much uncertainty as to how far the Army should rush toward embracing systems invented and deployed in countries whose military traditions and requirements are quite different from those of the Chinese.

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[23] Jürgen Domes, "The 'Gang of Four' and Hua Kuo-feng: An Analysis of Political Events in 1975–76," The China Quarterly, September 1977, pp. 473–497; Peter R. Moody, Jr., "The Fall of the Gang of Four: Background Notes on the Chinese Counterrevolution," Asian Survey, August 1977, pp. 711–724; Alan P. L. Liu, "The 'Gang of Four' and the Chinese People's Liberation Army," Asian Survey, September 1979, pp. 817–837; and Harry Harding, Jr., "China After Mao," Problems of Communism, March-April 1977, pp. 1–18.

[24] Author's conversations with senior PLA officials, Beijing, May 1979.

[25] The Directive has not been published openly, but it's contents are authoritatively reflected in several Chinese publications. One is: Theoretical Group of the National Defense Scientific and Technological Commission, "Integration of Millet Plus Rifles with Modernization—Criticizing the Crimes of the Gang of Four in Undermining Modernization of National Defense," in FBIS–PRC, Jan. 23, 1978, pp. E1–E6. Deng Xiaoping and Ye Jianying are alleged to have delivered speeches at the Military Affairs Commission Enlarged Meeting, June–July 1975, which led to the Directive and which was thereafter suppressed, allegedly, by the "Gang of Four" in 1976. See Editorial Department of the Liberation Army Daily, "A Struggle Concerning Major Issues of Right and Wrong on the Military Front," In People's Daily, Jan. 30 and FBIS–PRC, Jan. 31, 1978, pp. E1–E6. The gist of Deng's speech is in Theoretical Group of the Headquarters of the PLA "Perservere in Grasping the Key Link in Running the Army Well and Speed up the Building of Our Army—Criticizing the 'Gang of Four's Crimes in Opposing the 1975 Enlarged Meeting of the Military Commission" Hongi (Red Flag), Feb. 2, 1978, pp. 2–11 (in FBIS–PRC, Feb. 22, 1978, pp. E9–E20).

C. 1976–81

The period since 1976 has seen the drawing out in detail of the implications of the previous seven years. In military production, the Chinese have concentrated their industrial forces in those areas where they could make improvements that count militarily and are within their capability to produce: ground force equipment such as anti-tank missiles, associated electronic equipment, and surface-to-air missiles; more ships, particularly submarines and destroyers; an air-to-air missile for the air force; and at least one nuclear missile submarine (but no missiles as yet) and more and longer range ballistic missiles for the strategic forces.[28] The most important decision taken, therefore, was not to go in for a wide range of new weaponry immediately, since the know-how, the plant capacity, and the human and financial base would not be available for many years. Thus, although some improved models of jet intercepters and bombers continue to be produced in limited numbers, China has apparently decided to wait until favorable contracts with Western countries are signed for technology transfer of whole weapon systems and for the technological-industrial base to catch up to the advanced levels required. A major drive has been conducted to inspect Western military technology, to establish close working relations with Western military leaders and with Western defense industries, to encourage the transfer of military technology to China as rapidly and as inexpensively as possible, and to send students and delegations to foreign countries to learn about Western techniques, especially military technology, management of military systems, and logistical techniques.[29] China has also obtained sample pieces of advanced military equipment from several foreign states, presumably with the intent over the long run of replicating or improving on it through the (admittedly difficult and risky) process of reverse engineering.[30]

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[26] The Spey engine deal is symptomatic of the problem of acquiring, replicating, and producing a high volume output of advanced military technology. Negotiations with Rolls Royce began in 1972, culminated in a 1975 agreement to sell 50 engines to the Chinese, to help them build an engine plant in Xian, and to render technical assistance in testing and maintenance. All of this was done, but by the beginning of the 1980's the factory had yet to produce the output anticipated and to remove the "bugs" from the mechanism. Thus, nearly a decade after initial contact, the Chinese had yet to deploy, in numbers, a native-produced advanced jet fighter. Meanwhile, jet engine technology in the West and the Soviet Union progressed, rendering the Spey at least partially obsolete.

[27] For an authoritative list of 25 Chinese negotiations on military, and military technology, transfers 1972–1980, see William T. Tow and Douglas T. Stewart, "China's Military Turns to the West," International Affairs, Spring 1981, pp. 286–300.

[28] Fraser "Military Modernization in China," fn. 1; International Institute for Strategic Studies, The Military Balance (London, yearly 1976–1980); and Asian Security, 1979, pp. 78–92 and 1980, pp. 88–104 (Tokyo: Research Institute for Peace and Security, 1980 and 1981 respectively).

[29] With the United States alone, 13 exchanges were conducted between early 1979 and mid-1981.

[30] This includes Soviet MIG–23 and SAM–6, obtained from Egypt, American arms transferred from Vietnam before 1976, and Soviet anti-tank weapons captured in the Sino-Vietnamese conflict of early 1979.

Perhaps the most important part of military modernization in the recent period has been intra-PLA changes in leadership, training, and organization. Although the Army still is over-aged at the senior leadership level, there has been a concerted effort to retire superannuated top commanders (usually by easing them out through making them consultants-in-experience to their successors).[31] Much attention has been devoted to training, increasing the time devoted to field exercises as opposed to political study, paying more attention to combined arms and inter-service drills, improving individual skills especially in the areas of anti-tank warfare and air tactics, and holding up for emulation not merely heroic individuals (Lei Feng) or units (the Sixth Hard Bone Company) but also fostering competition between units and individuals and increasing standards of performance.[32] There are signs that China will revamp her service school system, that technical education is being fostered on a remedial basis for commanders as well as soldiers, and that command, control, and communications exercises are becoming an important part of training.[33] The most important aspect of these changes, aside from their contribution to making the Army a more credible fighting machine, is that they are relatively cost-free, that is, they can be carried out within the present severe budgetary constraints.

4. MILITARY OPPOSITION TO ITS ASSIGNED PLACE IN THE FOUR MODERNIZATIONS

The budget seems the main difficulty for the Army, and is one vehicle for expressing frustration over the deliberately slow pace of military modernization imposed by the priority given to other sectors of the economy. It is also closely tied to the debate over what kind of strategy is best to defend the country against the Russians while not yielding control over developments to the capitalist West. The budget has apparently not been increased, in real terms, more than marginally since Mao's death.[34] Indeed, there have been two absolute cuts since 1979 as a means, respectively, of returning to budgetary outlays more consistent with levels prior to the Chinese incursion into Vietnam and as a response to the general cutbacks ordered in late 1978 and 1980–81 in the economic program, for which the military was apportioned its fair share.[35] The result is that the military budget has probably not increased, in real terms, in the entire decade since Lin Biao's death, and as a percent of gross national product it has no doubt declined. Still, it is between five and ten percent of total yearly output, a not insubstantial figure for an economy as dependent as China is on the non-industrial sector. A relatively high percentage of installed capacity and of human capital is still devoted to defense. In these terms, the military has little to complain about.

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[31] In early 1980, a large switch of regional PLA commanders and commissars occurred, the first since 1973. Some were assigned to central organs—the Military Commission, the general staff, and advisory groups to those bodies. For details see "Quarterly Chronicle and Documentation," The China Quarterly, June 1980, pp. 381–382. This effort was undoubtedly only an initial effort, as the number of old (age 60 and beyond, e.g., soldiers who joined the army in the Yenan period or before) military leaders still in uniform is still quite large. In 1978, the Party promulgated the "Regulations Governing the Service of Cadres of the People's Liberation Army" and the Jiefangjun Bao (Liberation Army Daily) published an article, "Regarding the Passing-down, Helping, and Guiding as a Cause," on Oct. 7, 1979 Yet in 1982 full implementation was still lacking.

[32] The integration of training and skills with good "moral" (i.e., ideological) qualities has been one of the themes of every Army Day (August 1) speech since 1976. The PLA newspaper, Jiefangjun Bao constantly carries articles on military model units or persons (see, for example, "Sixth Hard Bone Company-Model of Unity of Politics and Training," in the Mar. 4, 1977, issue). For a summary of these efforts, see Ellis Joffe and Gerald Segal, "The Chinese Army and Professionalism," Problems of Communism, November–December 1978, pp. 1–19.

[33] Relevant sections, Chairman of the Joint Chiefs of Staff, Military Posture, 1977–81 (Washington: Organization of the Joint Chiefs of Staff, 1977–1981); Li Chung-ming, "Training Reforms in the Chinese Communist Air Force," Issues and Studies, November 1980, pp. 54–60.

[34] National Foreign Assessment Center, "Chinese Defense Spending, 1965–1979" (Springfield, Va.: National Technical Information Center, 1980), Xu Xiangqian: "Strike to Achieve Modernization in National Defense—In Celebration of the 30th Anniversary of the Founding of the People's Republic of China," Hongqi, October 1979, pp. 28–33.

Nonetheless, it is clear that some in the Army opposed the low priority given to national defense, and sometimes openly. At least one group in 1977 challenged the decision to put military modernization last by asserting that the military should be put first, not merely for reasons of national defense but because, being the most advanced sector technologically, the military portion of the economy could more efficiently pull the rest of the economy along with it.[36] The people's war doctrine has also been buffeted by the recent changes. How, some asked, is it possible to defend the gains of the revolution when, through a strategy of "luring the Russians deep," China might well lose important border provinces, a significant portion of its population, and much of its advanced industry (to say nothing of the nation's capital itself)?[37] Is people's war, in any version, really suitable for the age of massive possession of nuclear weapons, e.g., when the Russians need not even invade China to destroy it? And although the military was told to stay out of politics, it did not and could not. Too many of the top leaders are military or former military leaders; the question of where to put military modernization in the scale of priorities cannot be separated from the broader issue of overall economic development; and the national defense issue is inextricably intertwined with the question of China's broad foreign policy orientation toward the West and against the Soviet Union. Finally, the fate of Hua Guofeng was tied to the military-in-politics issue. He attempted to garner support among certain military leaders by advocating a stronger role for defense in the modernization scheme, by playing up to the Army in regard to their dissatisfaction with political leadership changes (particularly the question of Xu Xiangqian's successor as Defense Minister and the shifting and replacement of many regional military chiefs), and by associating himself with those in the military (e.g., Li Desheng) who seemed to have opposed Deng Xiaopings material incentives first/ideology second emphasis in economic development.[38]

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[35] Beijing Review Sept. 8, 15, 22, and 29, 1980, reporting on the third session of the Fifth National People's Congress. Officially stated "expenditures on national defense" for 1980 declined from 22.24 billion yaun in 1979 to 19.33 billion, were scheduled to rise in 1981 to 20.17 billion, but were cut again in 1981 (Beijing Review, Mar. 2, 1981, p. 6).

[36] Theoretical Group of the National Defense Industry Office, "The Strategic Policy on Strengthening Defense Construction—on Studying Chairman Mao's Dissertation on the Relationship Between Economic Construction and Defense Construction," Guangming Ribao, Jan 20, 1977 in FBIS–PRC Jan. 31, 1977, pp. E1–E5; Theoretical Group of the Academy of Military Science, "Speed Up the Revolutionization and Modernization of Our Army, Build a Powerful National Defense Army," Hongqi, August 1977, pp. 31–35.

[37] Roberts op cit.: fn. 18, chapters III and IV, cites many Chinese sources from 1973 to 1980, definitively documenting that the "luring deep" strategy was constantly under attack by Army commanders. To this writing, however, it has not been replaced and—in the writer's opinion—cannot safely be modified until the PLA is capable of defending its Soviet borders at or near the boundary. That in turn depends on the pace of Chinese military modernization, Soviet countermeasures, and the degree of American military support for China.

[38] Hua's status was in doubt from at least the Party's Third Plenum, December 1978, and took an unambiguously downward course at the Fifth Plenum in February 1980. More and more he attempted to save his position by appealing to those elements in the Army, possibly led by Ye Jianying, who opposed the trend away from Maoist orthodoxy, favored more emphasis on military modernization, and disliked the penetration of Western influence Hua spent increasingly lengthy periods with the military and made military fora the occasions for his more public utterances. It did him no good: at the December 1980 Party Work Conference he was forced to tender his resignation, which was accepted at the Party's Sixth Plenum in June 1981.

Civil-military relations in general have been tenuous. For one, the military came in for much criticism for attempting to hold onto its privileged position in society (student demonstrations occurred in 1979 and allegorical literature appeared in 1980 attacking this aspect of Chinese society).[39] For another, the Party attempted to undue further military influence at the provincial and local levels by encouraging military self-criticism for its role in the Cultural Revolution and by direct criticism of many Army leaders for their excesses during the era just past. Because the Army was so completely involved in the Cultural Revolution and because the Revolution was now so heavily criticized, many military leaders considered that they were being singled out for castigation and complained accordingly.[40] Understandably, the Army was reluctant to examine its behavior too closely in the Party-led investigation of the Cultural Revolution era's "three support and two military's" campaign. The consequent foot-dragging generated tensions.

A third problem was the Party's insistence that the Army change its provincial and top-level leadership more rapidly and promote younger officers faster. Many of the military region commanders were replaced or transferred in late 1979-early 1980, the broadest such change since Mao's death. Many who gained during the Cultural Revolution were replaced by others who had suffered. At the top level, such politically troublesome older generals as Chen Xilian and Xu Shiyou were moved to relatively innocuous senior positions and a struggle ensued for the Defense Ministership. At first it appeared that Geng Biao, one of Deng Xiaoping's men, and not a military figure, would get the job. Then it appeared that Yang Dezhi, the Army Chief of Staff, was the front runner. Although also a Deng associate, he was a senior military leader with long experience and high prestige, hence more acceptable to the Army than Deng. But in early 1981 Deng got the job, amidst declining support for Hua Guofeng and a Party-induced compaign of loyalty pledges for the military.[41] All three of these developments demonstrated that, while there is little possibility of overt military opposition to Party reforms and to the general scheme of modernization, there is substantial subterranean resistance and that, on occasion, the Army can critically delay specific policies.

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[39] The students were angry that the military still occupied student dormitories at the People's University in Beijing. Cultural Revolution-generated grievances against the Army came into the open in 1980 once the Cultural Revolution, in which the Army played a large part, was clearly rejected. See the People's Daily editorial of December 23, 1980. The Army response was luke-warm—knowing it was vulnerable to criticism—and the Party itself was divided as to how to treat the issue. On the one hand, the Deng Xiaoping-led modernizers needed military support for their program, however it short-changed the PLA in the immediate sense. On the other hand, the military represented the most powerful opposition to Deng's program and dragged its feet whenever possible—a good example being the Army rectification campaign of late 1980.

[40] The December 23, 1980 People's Daily editorial said: "Various . . . PLA units must try to understand how to help in handling Army-government and Army-civilian problems instead of complaining. . . ." Apparently the former Defense Minister, Ye Jianying, and the former Gwangzhou Military Region Commander, Xu Shiyou (both Politburo members and the latter a Cultural Revolution beneficiary) were among those who voiced complaints.

[41] Chen Xilian was removed from his position as Beijing Military Region Commander and from the Politburo and the State Council. He retained his seat on the Military Commission. Xu Shiyou, having previously been exiled to the Urumchi Military Region, was removed from that post and returned apparently in disgust to Nanjing. He was, however, kept as a member of the Politburo and the Military Commission.

A struggle ensued in late 1980—early 1981 over the Defense Ministership apparently connected with the demise of Hua Guofeng as Party Chairman and with general military restiveness with the Deng Xiaoping modernization program as it affected the PLA. The military lost that battle and Geng Biao was brought in to ride herd on them. Concurrently, all of the 4 million member army were made to swear renewed fidelity to the Party. For the "Soldier's Oath," see FBIS–PRC, Mar. 3, 1981, pp. L3–L4.

Finally, in late 1980 and early 1981, unmistakable signs appeared of military opposition to over-reliance on the lean-to-the-West political strategy and to too much trust in the people's war military strategy. Allegorical articles appeared in the People's Daily and in Hongqi [42] advocating, in a thinly disgused manner, making temporary compromises with the Soviet Union for the sake of moving ahead faster with industrialization, and shifting foreign policy back to opposition to the United States and to preparing for investing Taiwan by force. Other allegorical writings supported the notion that the military was hardly fully committed to support the Party's position of military modernization last, especially after the even further shift in that direction at Party meetings in late 1979,[43] Finally, Guangming Ribao published two allegories in February 1981.[44] The first drew parallels between a too-aggressive, defense-at-the-border strategy of the Jiangsi Chinese Soviet in the early 1930s and similar presumably mistaken notions today of defending China as whole right up against the Soviet boundary. Since the "luring deep" strategy is part and parcel of the people's war strategy, and since the people's war strategy is one of the reasons why military modernization can be put last (i.e., it costs less and the military depends on less advanced military equipment), the allegory clearly showed that many in the military advocate a reversal of the present order of priorities, placing the military first, not last, and heavy industry ahead of light. The second, opposing, allegory was even more specific. Drawing parallels between the present and late-19th century debate over coastal versus land border defense, specifically with reference Xinjiang, it referred approvingly to the decision to send an expedition to defend that province at its outer borders, to raise funds for the army, and to provide a broader economic base for that effort.

5. EFFICACY OF THE REQUIREMENTS APPROACH TO CHINESE STRATEGY

These perturbations notwithstanding, however, it seems clear that China will stick to the strategy of modified people's war and military modernization last, at least for the foreseeable future. The military cutbacks and the appointment of Qeng Biao, both announced in March 1981, seemed to assure that. This brings us back to our first query: is the "requirements" approach sufficient to do the job of defending the country without undue risk and without fatally compromising other Chinese interests? There are two ways of answering this question. The first is to ask whether, in all probability, a strategy of people's war under modern conditions can do the job. The second is to investigate possible alternative strategies of military modernization and defense.

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[42] The first such article appeared in Guangming Ribao on July 8. 1980. Qing Dynasty officials during the Sino-Japanese War of 1894–95 were judged correct in resisting those who opposed too rapid modernization and who favored territorial compromises with Japan. A Hongqi article on Jan. 1, 1981, approved of Lenin's 1918 Treaty of Brest-Litovsk with Germany on the grounds that it provided time for the new government to become strong. These two articles obviously lined up on different sides of the modernization/outright-resistance-to-the-Soviet Union line adopted by the Deng Xiaoping leadership. The People's Daily on Jan. 8 published an article approving Zhou Enlai's proposal during the 1927 Northern Expedition to strike eastward against Chiang Kai-shek (read: Taiwan) rather than further northward against the warlords (read: The Soviet Union).

[43] Aside from the Guangming Ribao article mentioned immediately above, these include a series of ostensive attacks against Qi Benyu, an ousted Cultural Revolutionary associate of Mao and (allegedly) of Lin Biao, in Lishi Yenjiu, December 1979; Guangming Ribao, Jan. 8, 1980; Hongqi, July 1980; and People's Daily, April 10 and June 29, 1980, and Jan. 17, 1981.

[44] Feb. 4 and 20, 1981, entitled, respectively, "Recollections and Inheritance—In Memory of Comrade Wang Jianxiang" and "A Tentative Analysis of the 'Debate (in the 1870's) on Coastal Defense Verus Land Border Defense'."

"Doing the job," in the minimal sense of the term, means deterring the Soviet Union from initiating conflict with China, being able to punish the Russians severely if they actually did invade, and eventually throwing them back to restore China's pre-invasion boundaries. There is no way of knowing, other than in war itself, whether the later two components are satisfied by the people's war-in-modern-conditions strategy and the economic priorities behind it. However, it seems reasonably clear that the strategy meets present requirements for deterrence. The Soviet Union has not attacked; it is not presently configured for attack; and it has no present intention of attacking.[45] While it may be objected (and many in China have objected) that this puts too much burden on a favorable assessment of Soviet intentions, as opposed to capabilities, the fact is that the present strategy does meet the minimal requirements of the situation. There is a calculated risk inherent in this approach, of course. But it is exactly to minimize those risks, as well as for broader reasons, that the Chinese leadership has opted to take out insurance in the form of security ties with the United States and other Western countries. Thus, within present budgetary confines and together with the promise of a reasonable flow of economic, technological, and out-and-out military assistance from the West, the strategy is working well.

On the other hand, there are more-than-minimal aspects of the "requirements" approach that the present strategy does not satisfy. First, it is not clear that China will ever be able to catch up with modern military standards across the board (which must be done to deter the Soviets in the long run) so long as Beijing proceeds in the present direction at the current pace. The costs of acquiring the necessary hardware in appropriate quantities is rising exponentially and the traditional advantage accruing to the latecomer is not necessarily true in the present era of military modernization.[46] Twenty years from now may thus find the Russians even farther ahead, therefore even more threatening, and China even more beholden to foreign military assistance and security ties. Second, one of the objectives of military modernization of any state, China not excluded, is to provide itself with a "modern" military for general purposes. China cannot convince itself or any other state that it is "modern" unless and until it has such a military machine to show off and until it has actually defeated in battle other first line armies.[47] It has always been thus, and there is no reason to presume that China will prove an exception. It follows that the present low posture course is unlikely to last throughout the whole period of the four modernizations, especially if its expected duration is measured in terms of several decades to a half century. At some point, the Chinese leadership may turn impatient and revise priorities and strategies.

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[45] To conduct a massive ground attack against China and seek permanently to occupy large amounts of territory would require more than the 51 divisions now deployed east of Lake Baikal. Moreover, they would all have to be brought up to full strength (e.g., Category I), whereas most are now in Category II and III. Finally, Soviet Asian strategy has been basically defensive, ever since 1969 when the massive Soviet military buildup moved into high gear. A multiplicity of arguments support this (which is not only Soviet assertion but the author's conclusion as well): The Chinese nuclear deterrent; Soviet troubles elsewhere; the efficacy of the Sino-American connection; general Soviet Asian policy; the military propensites of the Soviet Union over 60 years; the vastly unfavorable world political configuration subsequent to Soviet attack; and the enormous cost to the Soviet economy of such a venture.

[46] See Seymour J. Deitchman, "New Technology and Military Power: General Purpose Military Forces for the 1980s and Beyond" (Boulder, Colorado: Westview, Press, 1979), for evidence of this trend toward rapidly rising costs.

[47] That what China did, to its advantage, in the fall of 1962 against India. It did not do so against Vietnam in early 1979, probably could not do so against India now, and certainly could not face the Soviet Union on a modern battlefield.

The third unsatisfactory aspect of the requirements approach, as minimally stated, is that states during the modernization drive tend to feel the need to express their new-found power in a more forward foreign policy. New interests are discovered or old, dormant interests are brought back into prominence, as national power increases.[48] Since China's overall national power, relative to most of her neighbors, is likely to increase relatively rapidly (barring unforeseen circumstances and presuming no great deviance from the present economic course), the country will more and more be tempted to exert its power abroad. But its leaders will then ask what instruments of policy are at their disposal for such activities, and whether there is a "proper," i.e., balanced, mix of the various instruments of policy. When they realize that the military instrument—traditionally the most important and the most prestigious—is still in a relative state of disrepair, they will in all likelihood move to enter on a different program of priorities, with the military accorded a high value and a greater share of resources.

6. Two Alternative Military Strategies

A. PUT MILITARY MODERNIZATION FIRST

It is pressure along these three lines of argument that have already been seen in the post-Maoist period of military modernization. Although kept within bounds for the while, it can only increase with time. It follows that the requirements approach, minimally stated, is unlikely to be maintained as China's unaltered defense strategy throughout the Four Modernizations era. This brings us to ask what other alternatives might present themselves to the Chinese leadership. Two variants appear likely. One is that already advocated by some military leaders, as noted above: to reverse the order or priorities, put the military and heavy industry first, make the rest of the economy slave their demands and, through forced draft, pull it along behind. This is essentially what the Soviets did during their first several five year plans. Fearing war and finding themselves alone, they prepared for it as fast as they could. Although political problems (the purges) and personality excesses (Stalin) interferred, in the end they were successful in defending the Motherland from German invasion and went on to become a superpower. Costs were high, to be sure, in terms of starvation, living standards, and cultural and political deprivations, but were worth the gains obtained (or so the argument goes).

Can China do the same? The present leadership says no, and for good and well-known reasons. China is not Russia. The huge population needs to be fed. There is little new land on which to grow food. China is economically more backward, relative to the present, than the Soviet Union was in the 1930s. Technology and quality are the needs of the time, not steel and quantity. Today's military strategy is dominated by nuclear weapons, organization, logistics, and electronics, not numbers of men, quantities of tanks, individual bravery, and slow, grinding campaigns.

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[48] The entire history of the modern state system demonstrates the veracity of the linked nature of the interest and power. Every new and powerful actor—from France in 1789 through the United States and the Soviet Union in the mid-twentieth century—has expanded its scope and geographic extent of interest as its national power has increased through modernization. It is, to be sure, relative, not absolute, power that counts, so that Great Britain today finds its relative power has declined, thus leading it to contract its interests.

But it is not an open and shut case. China can already feed itself, and perhaps will do so increasingly well in future, thus generating the surpluses needed for industry. Chinese learn modern techniques amazingly fast when placed in the proper environment, which is now being provided at home and abroad. The leadership is determined never again to permit the excesses of the Cultural Revolution. China already has an important and variegated industrial base, including much investment in high technology, and there is no reason to think that lack of basic factors of production will hold the country back. Finally, by importing technology, capital, and management skills from the West, and by partially integrating its economy with that of advanced industrial countries, China may be on the verge of explosive growth in gross national product.[49]

For all these reasons, there may be more room than is presently thought for a major revision in modernization priorities in favor of the military and heavy industry, if not a total reversal. This may be particularly true if China can, through political/security compromise with the Soviet Union, obtain additional increments of economic support from Moscow and its East European satraps, thus even further increasing the pace of production. And an added impetus might come were the present course of modernization to run into increasing difficulties, or were the Chinese economy, being still centrally planned and state owned, to look more and more like the Soviet economy. Many might then argue that it is best to call a spade a spade, to go the rest of the distance back to the Soviet model, and hence to put heavy industry and the military first.

B. ADOPT THE WESTERN APPROACH TO MILITARY MODERNIZATION

A second alternative strategy of military modernization and defense is to move much farther in the direction of the "Western" model.[50] There is, of course, no such thing as a pure model of the Western approach to military strategy (taken in the broadest sense of the term), especially since Soviet strategy is itself a variant of the "Western" model. Nonetheless, there are enough differences in emphasis between what has come to be a reasonably common approach, in NATO and American-allied states in Asia and elsewhere, and the Chinese military tradition under the Chinese Communist Party and the People's Liberation Army, to warrant its consideration as an alternative for China.[51] No nation can, or would wish, deliberately to put aside its own military tradition, and the people's war emphasis is too strong and too recent even to think of replacing it entirely in the near future. Moreover, people's war depends explicitly on the specific conditions still found for the most part in the Chinese military environment as noted above. But many in the West have asserted that "strategy" is in some ways being replaced by "technology," or at least that the current level of technology, in every era, determines strategy.[52] On such grounds, Chinese "strategy" is outmoded because technology has passed it by. This Marxist-like argument (e.g., contradictions between the superstructure—strategy—and the base—technology—can only be resolved, as they must, in favor of the base) should have, and has had, much appeal to Chinese military modernizers at every stage of post-1949 Chinese military thought and organization.[53] In the current era of pragmatism über alles, therefore, the Western approach ought to have special appeal.

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[49] It is true that most analyses by Western economists in the early 1980's stress the problems faced by China and thus come to pessimistic conclusions. The Chinese themselves seem to agree with such an analysis. But they, and non-Chinese observers, may be surprised. While there are many uncertainties in China's future, the most important being the political climate, the required mixture of elements for high growth is present. These include: reasonable political harmony at the top of the Party; appropriate ordering of the Four Modernizations; absence of large-scale, ideologically-based social disorders and political campaigns of the Cultural Revolution variety; existence of a solid economic base in both industry and agriculture, and a well-developed infrastructure—social, economic, and political; renewed stress on education, economic incentives, and labor discipline; a mixture of private and public ownership and management; and probable sufficiency (if not plentitude) of food, natural resources, and energy.

[50] Edward Earle Meade (ed.), "Makers of Modern Strategy" (Princeton: Princeton University Press, 1973); Michael Howard (ed.), "The Theory and Practice of War" (New York: F. A. Praeger. 1966); Russell F. Wiegley. "The American Way of War" (South Bend: Indiana University Press, 1973); and Marshal V. D. Sokolovskiy, "Soviet Military Strategy," 3d edition, (ed Harriet Fast Scott, New York: Crane, Russak, 1975).

The Western model has been variously described, but to the author includes at least the following elements.

(1) Substitution of firepower and mass for manpower and strategems; hence, a strategy of annihilation rather than of attrition;

(2) Dependence on time to mobilize (or, in the modern era, on the technology of early warning); hence, the tendency to small standing armies backed by a large reserve force and the tendency to emphasize the technology of intelligence;

(3) Substitution of accuracy over quantity of destructive instruments; hence, an emphasis on high-technology electronics;

(4) A split on the weight given to surprise. Israeli experience and Soviet doctrine and deployment both emphasize the extreme importance of achieving surprise at every level of conflict. The American

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[51] William W. Whitson, "The Chinese High Command" (New York: Praeger, 1973), "Introduction: Origins of the Chinese Communist Military Ethic and Style," pp. 3–28; Jack Harris, op. cit., f.n. 2; Scott A. Boorman, "The Protracted Game: A Wei-ch'i Model of Maoist Revolutionary Strategy" (New York: Oxford University Press, 1969); Scott A. Boorman and Howard L. Boorman, "Mao Tse-tung and the Art of War," The Journal of Asian Studies, 1964, pp. 129–138; Samuel B. Griffith, III, "Sun Tzu—The Art of War" (Oxford: Clarendon Press, 1963); and Mao Zedong, "Selected Military Writings" (Peking: Foreign Languages Press, 1963).

[52] Arms controllers and students of arms races as causes of war tend generally to this view. See, for instance, Graham Allison and Frederic Morris, "Armaments and Arms Control: Explaining the Determinants of Military Weapons," Daedalus, summer 1975, pp. 122–126; and Lewis F. Richardson, "Arms and Insecurity" (Pittsburgh. The Boxwood Press, 1960). Theorists of nuclear deterrence also move in this direction, as for instance Herman Kahn, "On Thermo-Nuclear War" (Princeton: Princeton University Press, 1961). See also International Institute for Strategic Studies, "New Conventional Weapons and East-West Security: Parts I–II" (London: IISS, Adelphi Papers 144 and 145, spring 1978)

[53] J. Chester Ch'eng (ed.), "The Politics of the Red Army" (Stanford: Stanford University Press, 1967); Gittings, Nelson, Whitson, and Godwin, op. cit., f.n. 4; Samuel B. Griffith, III, "The Chinese People's Liberation Army" (New York: McGraw-Hill, 1967); Alice Langley Hsieh, "Communist China's Strategy in the Nuclear Era" (Englewood Cliffs, N.J.: Prentice-Hall, 1962); Harry G. Gleber, "Technology, Defense, and External Relations in China, 1975–1978" (Boulder, Colorado: Westview Press, 1979); and Ellis Joffe "Party and Army: Professional and Political Control in the Chinese Officer Corps 1949–1964" (Cambridge: Harvard University Press, 1965).

approach is to emphasize technique of execution, planning, and individual resourcefulness at all levels;

(5) Stress on logistics, management, service and maintenance, turnaround time, and command, control, and communication, all highly dependent on a solid industrial and educational base and on state-of-the-art technology;

(6) Prominence of strategic and nuclear war as opposed to tactical and conventional conflict; hence, a tendency to favor deterrence over war-fighting (although this is changing) and strategic forces—missile, air, and submarine—over conventional forces—ground and surface navy;

(7) In tactics, emphasis on mobility rather than ground-holding and on combined arms and combined forces operations rather than independent unit operations and separation of campaigns into service-based theatres.

If the Chinese are looking for a way to deter and defeat the Soviets (and to go on to using the military for other foreign policy ends), if the people's war-under-modern-conditions approach has fatal flaws, and if the assumption of technological dominance at the base of the Western approach is valid, China may have no choice but to move in this direction.[54]

Implications follow immediately. One is the need for near-total professionalization, including rigorous separation of the Army from politics, restoration of ranks and privileges, and thoroughgoing emphasis on training over ideology. Another is reduction in the total size of the military, using the money saved for more intensive training, production, and procurement of higher-quality equipment. A third is revision of the balance—in terms of manpower and budgets—away from the ground forces and surface sea forces and toward the air force and the strategic nuclear forces. A fourth is change in the current emphasis on the militia in favor of a more or less fully equipped reserve force. Fifth is the revision of procurement (including the whole research, development, testing, evaluation, and production process) in favor of high technology items—especially nuclear weapons, precision-guided munitions, electronic warfare gear, and sophisticated radars—and improvement of the logistical base—trucks, spare parts and repair depots, and air transport equipment. To help pay for such changes (as well as to stop wasting money currently being uselessly expended), procurement of outmoded weapons systems such as 1960s-style tanks, guns, and aircraft would be severely curtailed. A final implication is in the realm of Army-society relations. The quality of recruits and of officers would have to increase rapidly, necessitating corresponding improvements in the entire education system. The Army would have to cease its still-intensive involvement in society. And localities (or the nation as a whole) would have to take on an added burden of feeding and otherwise caring for neighboring military units, which would have to dispense with the present system of self-reliance.

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[54] This conclusion was more than hinted at by senior Chinese military officers at the Chinese Military Academy, May 2, 1979. Conversations with the author. The Chinese are well aware, for instance, of the important role played by precision-guided munitions in the Arab-Israeli War of 1973, of the Americans use of such weaponry in the latter stages of the Vietnam War, and the utility to which they were put by the Vietnamese against China in early 1979.

7. INCREMENTAL MODERNIZATION AS CHINA'S ONLY MILITARY STRATEGY

There is little indication as yet that the Chinese military is moving massively in these directions. Only in points one, four, and five are changes visible that would indicate adoption of such an alternative. Indeed, it would seem highly unlikely under present conditions for China to decide to revise its historic emphasis so drastically. Moreover, the Chinese leadership evidently debated the issue in roughly these terms, if the information noted above eminating from several national conferences on defense modernization, Army work conferences on specific areas of modernization, and high-level Party and government meetings during the post-1976 half-decade is authoritative. Uniformly, they show both Party and Army much interested in the above aspects of the Western approach but, always, subsequent decision to persevere along the people's war path or to proceed only slowly and cautiously toward the Western model. At China's present level of economic development and societal modernization, wholesale adoption of the Western model could bankrupt the nation. How much easier and smarter it is to convince the West, especially the United States, to substitute itself for the shortcomings of Chinese defense—in nuclear deterrence of the Soviet Union and in high technology areas—and then to obtain at as low a cost as possible the economic assistance, experience, capital, and outright transfers of military equipment that will fill some of the gaps so evident in China's defense strategy.

That is what the Chinese leadership has decided to do: to persevere largely along traditional lines, making internal improvements only when it can be demonstrated that total costs will not rise drastically, bringing in the foreign barbarians of the West to help keep away the foreign barbarians of the East, and setting the stage for eventual transformation. That transformation will be along the lines of the Western approach if that proves, on reflection, to be the better way to proceed. On the other hand, there could be gradual adoption of the first, more Soviet-oriented alternative once the Chinese economy is strong and diverse enough to bear the burden. China's military modernization strategy thus seem to be one of delay, of sub-optimization, of capitalizing on known assets, and of balancing enemy against enemy. Thusly defined, China will probably continue to adhere to the requirements approach for the next several years (barring, that is, major political reorientation internally or large-scale conflict with the Soviet Union or its Vietnamese ally). The next choice point, in terms of major departures, is probably the middle to late 1980s, for only by then will the country have been able to overcome the backsliding of the recent past and have been able to improve the economy significantly. If a prediction may be ventured, therefore, it is for relative stability of direction and pace of Chinese military modernization along lines by now clearly evident.

CHINA'S MILITARY STRATEGIC REQUIREMENTS

By Sydney H. Jammes and G. Lawrence Lamborn*

China's defense modernization program, a two-decade effort aimed at improving the People's Liberation Army (PLA) and the defense industries, is making limited progress but has far to go. The effort arises from deep-rooted apprehension over Soviet military capabilities and from the leadership's desire to "move China into the front rank of nations" by the year 2000. It will be successful only if the nation enjoys prolonged political stability, retains access to foreign capital and technology, avoids costly foreign military campaigns, and moves forward in higher priority efforts to modernize agriculture, industry, and science and technology.

China's prospects for military modernization are influenced by strengths and weaknesses in its political, economic, and technical bases. The country suffers from a serious shortage of trained technicians and deficiencies in key technologies and defense industries. The principal factors favoring success of the modernization drive include the leadership's dedication to the program and the availability of foreign technical and financial assistance (to the extent that Beijing can pay for costly technology).

BACKGROUND

The Chinese consistently describe modernization of the PLA as a process of gradual force improvement based upon self-reliance that will require many years to accomplish. In China the term "force modernization" implies making fundamental institutional changes in the PLA and the military industrial base, instilling new thought patterns and skills in PLA commanders and troops, and—eventually—introducing new weapons and equipment.

The genesis of the present military modernization drive was Premier Zhou Enlai's economic program set forth in 1972. Zhou proposed to modernize agriculture and industry in a program that provided the core of what later became the "Four Modernizations."

Defense modernization emerged as an issue in 1973, when China made its first inquiries about the British Harrier V/STOL ground attack aircraft and resumed negotiations for the transfer of the British Spey turbofan aircraft engine technology. In 1974, Deng Xiaoping, rehabilitated from his Cultural Revolution disgrace, assumed a prominent role in promoting military modernization.

The watershed year for defense modernization was 1975 with the publication of the modernization decisions of the Military Commission, the rehabilitation of former Chief of Staff and modernization advocate Lo Ruiqing, and the signing of an agreement to transfer Spey engine technology. The Military Commission's modernization decisions are believed to have ordained that the PLA be relieved of many nonmilitary concerns and be trained and equipped to meet the demands of modern warfare.[1]

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The death of Zhou Enlai in January 1976 triggered a series of political upheavals that led to the second ouster of Deng Xiaoping and the subsequent reign of the Gang of Four.[2] The Gang reversed or slowed many of the military programs begun by the Military Commission. The death of Chairman Mao Zedong in September, however, ended the Gang's activities, and the four were arrested in October. A new leadership group centered around Hua Guofeng and Ye Jianying began to take shape in late 1976.

The new leadership resumed the interrupted military modernization drive in 1977 and dispatched numerous delegations to Europe and Japan to study foreign military technology. In August 1977 the PLA announced a new doctrine of "People's War Under Modern Conditions" and Deng Xiaoping again returned to power.

IMPETUS FOR DEFENSE MODERNIZATION

China's pursuit of military modernization—in its present context—springs from deep-rooted apprehension over Soviet military intentions in Asia. The Chinese have viewed with increasing anxiety the marked growth over the past decade in the USSR's strategic and conventional military power, particularly the strengthening of Soviet forces along the Sino-Soviet frontier.

Despite such concerns, China evidently views the Soviet Union as a long-term threat rather than as an immediate danger, and defense modernization probably will continue to hold the lowest priority among the Four Modernizations. Civilian "modernizers" in the leadership make a strong case that defense modernization cannot proceed far without broad progress in agricultural, industrial, and scientific affairs. Accordingly, the Chinese themselves expect early results to be few and unspectacular, and they prefer to stress over the next 20 years the building of an industrial base that only eventually will enable China to produce a wide range of modern weapons.

STRENGTHS AND WEAKNESSES OF THE FORCES

The centerpiece of China's defense posture is its 3.5 million-man ground forces, most of which are infantry. The ground forces are organized according to the "Three-in-One" principle,[3] which calls for a defense in depth to contain a conventional attack by a militarily superior enemy. Most of the PLA's tanks, field artillery, antiaircraft artillery, antitank guns, and other equipment are based upon Soviet technology and designs of the late 1950s. Although some PLA equipment is obsolete by United States and Soviet standards, the ground forces equipment (see table) generally is rugged, reliable and still effective on the battlefield.

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[1] Although the Chinese media have referred to and described the Military Commission's 1975 decisions, the complete text of these decisions has never been released.

[2] The Gang of Four consisted of radical leaders Jiang Qing (Madame Mao), Zhang Chunqiao, Wang Hongwen, and Yao Wenyuan.

[3] The "Three-in-One" principle specifies that Chinese forces will be organized into main forces (maneuver units), regional forces (units that usually man fixed defensive positions), and militia (armed civilians trained to augment the other forces and defend local areas). Regional forces would attempt to slow an enemy's advance and channel his movements into terrain favoring defense. Maneuver units would seek to mount major defensive operations at times and places of advantage and—when possible—to counterattack. The militia would provide intelligence, logistical support, and replacement personnel to main and regional forces.

Though the ground forces have much of the equipment needed for wartime operations, several key deficiencies exist, chiefly in equipment for antitank and air defense operations. The ground forces also suffer from serious problems in logistics. Inadequate roads and motor transport slow the movement of troops to the battlefield, hamper their redeployment to counter breakthroughs, and limit the movement of ammunition and other supplies.

China's Air Force is the service least capable of successfully performing its mission. The Air Force lacks advanced avionics, missile systems, and jet engines. Moreover, it is the most difficult service to modernize, because needed technologies currently are beyond China's grasp and are extremely expensive.

The PLA Navy has many deficiencies but could effectively perform its primary mission of defending China's coast. A sizable force of diesel attack submarines would serve as a first line of defense against approaching hostile fleets. This is backed by a small but growing force of major surface combatants and numerous missile and torpedo boats. The Navy is deficient in air defense, antisubmarine warfare, and antiship missiles. Moreover, the Navy has few ships for transporting tanks and for providing fire support for large assaults.

Modernization of strategic forces continues to claim a portion of China's defense expenditures, but the Chinese are not expected to create large strategic forces. China increases the deterrent value of its strategic missile force by concealing and dispersing some missiles in remote areas.

PROBLEMS AND PROSPECTS FOR DEFENSE MODERNIZATION

CONSTRAINTS TO MODERNIZATION

China's military modernization is constrained by numerous fiscal, organizational, and technical factors, which the Chinese usually identify openly for Western observers.

HUMAN CONSTRAINTS

The defense industries—and the broader industrial base—face the prospect of a rapidly dwindling supply of trained researchers and engineers. Many were educated in France, Germany, or the United States during the 1930s and 1940s and returned to build a "new China" in the 1950s. They now are in their seventies and eighties and no longer able to carry the burden of research. A pool of 40,000 to 50,000 Soviet-trained engineers exists, most of whom were trained between 1950 and 1960. This group, however, is not as skilled as China's Western-educated engineers and is too small to fill Beijing's requirements for technically trained manpower. The Cultural Revolution period from 1966 to 1976 virtually destroyed the system of higher education, and few trained engineers or technicians emerged during this "Lost Decade."

The government is fully aware of the challenge it faces in training large numbers of new technicians. Until China has sufficient engineers and technicians trained in modern methods and conversant in modern technology, staffing for most major weapons programs will include older engineers lacking needed design and production skills. Still, China can mobilize enough technical talent for selected, high-priority projects in the strategic weapons, aircraft, and naval fields. Growing numbers of young students will begin to enter the defense industries in the next few years as the current emphasis on science and technology in the colleges and universities throughout China bears fruit. Several thousand engineering and technical students are currently taking advanced training abroad, and they too will be available in a few years.

ECONOMIC CONSTRAINTS

The relatively low priority currently being given to military modernization reflects the present Chinese leaders' recognition that they must correct fundamental weaknesses in the pattern and rate of economic development before they can undertake any dramatic upgrading of defense capabilities. The long-term average annual rate of growth of the Chinese gross national product is estimated to have been about 6 percent—a figure many other nations would envy. It masks, however, a host of economic problems that constitute an immense impediment to the modernization of the PLA. The impetus for growth has come primarily from industry (9 percent per year), while agricultural growth has lagged (growing at about 2 percent annually). If population also has grown at approximately 2 percent per year as is generally accepted, then the amount of food available per capita has not changed significantly during the past 20 years.

Industrial performance, though creditable in terms of overall output, also has been flawed. Electric power is chronically in short supply, and the production of such basic commodities as building materials, cement, and finished steel is insufficient for the economy's needs and has regularly required China to import such materials in recent years. With few exceptions, China's industry employs levels of technology that are from 10 to 30 years behind those in the developed countries.

Moreover, the resource allocation policies adopted in December 1978 (with the establishment of a three-year program of "readjustment" by the Third Party Plenum) do not, at least in the near term, support defense modernization. The program cut back investment in heavy industry—particularly the iron and steel industry—and increased allocations to agriculture, light industry, and the building materials industry. In addition, the leadership—while maintaining interest in acquiring foreign equipment and technology, and continuing to solicit (and receive) long-term credits to pay for such imports—have suspended or postponed many of the planned purchases from abroad. Finally, the program of readjustment probably will last at least five years rather than only three.

TECHNICAL CONSTRAINTS

The ability of the industrial infrastructure to support modern weapons development and manufacture is uneven. China produces most of the materials and basic types of machinery required for its current weapons production effort, but improvement in its military manufacturing processes will require the acquisition of a variety of modern industrial technologies. The problems tend to cluster in the area of materials, tooling, and electronics.

One serious deficiency is in the capacity to produce alloy and special steels and some nonferrous metals. China can produce small quantities of superalloys, electrical steels, and stainless steels, but will have to make considerable investments in new capacity before it can substantially increase its high-grade steel production.

A key weakness in China's nonferrous metals industry—a weakness that particularly affects aircraft and missile development—is its inability to produce high-quality aluminum, titanium, cobalt, and nickel. The technology currently in use is based on older Soviet equipment and production methods.

China's substantial machine tool industry can meet the country's needs for low- and medium-grade machine tools and can produce some good-quality general purpose machine tools for export. It is far less capable, however, of making the precision tools needed in the production of sophisticated weapons. In numerically controlled machine tools and computer-aided manufacture, China is still in the early stages of development. It can be expected to continue to buy precision machinery and equipment from Japan and the West.

The size of China's rapidly expanding electronics industry ranks with those in some of the developed countries in Western Europe. In technology, however, it lags substantially behind world levels.

MILITARY INDUSTRY CONSTRAINTS

Severe problems are apparent throughout Chinese defense industry from basic research to the maintenance of finished products. The most critical shortcomings are in the design of technology and manufacturing know-how. These particular shortcomings are exacerbated by an array of other problems, which afflict production and quality control methods, standardization procedures, and instrumentation and equipment. Many defense plants suffer from poor layout and inefficient use of labor, while the unpredictable ebb and flow in the supply of raw materials, components, and electric power often slows production.

INSTITUTIONAL CONSTRAINTS

Deficiencies in the PLA itself constitute another major constraint to military modernization. The forces are not well organized, trained, or equipped to receive new weapons. The absence of a modern logistics organization calls into question the PLA's ability to obtain spare parts when needed or to maintain and repair advanced weapon systems.

ASSETS TO MODERNIZATION

Despite the many restraints to military modernization, several noteworthy factors favor the program: the leadership is committed to modernization, foreign assistance is available, and Beijing has avoided expensive military entanglements since the Vietnam incursion. If China maintains these advantages over the next decade, it may well develop the foundation needed for eventually introducing large quantities of modern equipment and armament into the PLA.

LEADERSHIP ASSETS

Since early 1977 the party leadership has been increasingly committed to the twin policies of economic modernization and diplomatic opening to the West. Leadership reformers under Deng Xiaoping have carefully but persistently removed or weakened leaders opposed to these policies and have successfully eliminated much opposition. Serious economic and political problems remain, however, and newly appointed government and party leaders are under considerable pressure to show results and sustain the momentum of the modernization program.

FOREIGN ASSISTANCE ASSETS

China has an excellent credit rating, despite its economic difficulties, and many foreign governments are eager to sell to Beijing or to provide hard-currency loans. Between 1976 and 1979, many foreign industrial firms launched intensive efforts to sell large quantities of finished goods and whole plants. Despite strong Soviet pressure, the French and British Governments announced their readiness to sell arms to Beijing, and Chinese arms delegations found generally receptive audiences among arms manufacturers in Western Europe and the United States. To avoid dependence on foreign suppliers, however, the Chinese prefer to obtain technology rather than end-items. The leaders are also wary of undue dependence on foreign banks and other creditors.

By early 1979, China was conducting negotiations for arms technology with several West European governments; by the end of the year, however, the negotiations had slowed considerably. The slowdown probably was caused by China's reassessment of economic needs rather than by any European reluctance to sell. Additionally, China's leaders have begun to appreciate the difficulty of absorbing advanced foreign technologies into their weak technical base and have decided that exhaustive study is required before major purchases are made. Noting the high cost of modern weapon systems, they also may be weighing their cost-effectiveness, since they know that no single new conventional weapon system, whether Chinese or foreign-made will markedly change the Sino-Soviet military balance or significantly increase China's ability to defeat a Soviet attack.

FAVORABLE PLA ATTITUDE

The PLA high command generally has been eager to get on with defense modernization. Large numbers of officers who possessed few military skills and who advanced to the upper levels of the PLA during the Cultural Revolution have been removed since 1975. Although promotions still involve patronage and the old-boy network, the idea of making promotions more dependent upon demonstrated skills and readiness to implement modernization programs is gaining acceptance.

There are hints, however, that all is not well within the ranks. PLA Political Commissar Wei Guoqing said in a recent speech that officers and soldiers who do not agree with the current party line on modernization would be given a period to adjust their thinking. Objections could be raised through proper channels, Wei said, but there must be "no expression of opposition whatsoever in their actions."

There are several reasons for military grumbling about the modernization programs. Despite the leaders' stated commitment to defense modernization over the long-term, the PLA budget has been cut twice since 1979. This year, the military allocation was reduced by 6.4 billion yuan to help reduce the national deficit. Perhaps even more worrying to the top echelons of the military is the potential political fallout from the trial of the Gang of Four and the five former military leaders who had been followers of the late defense minister Lin Biao. Public denunciation of the five did little to enhance morale in the PLA. Finally, although the current military leadership and many of the younger officers are in favor of modernization, there is some reluctance to embrace the modernization program among the older officers who learned their trade under a different environment and would be forced to learn new skills and modes of operation.

INDIGENOUS WEAPONS DEVELOPMENT PROGRAM

In establishing China's defense industry during the 1950s, the Soviet Union withheld the expertise and means to develop new systems. When the Chinese were left on their own, therefore, they had to limit their research and development efforts to a few major projects. These generally have included one or two models in each major type of weapon system (such as aircraft, missiles, and ships). The systems now being developed show a substantial technological improvement over those currently being produced, but they are still based on weapons technology levels achieved by the Soviet Union in the early 1960s. Progress in general has been slow, and many projects that were begun in the late 1960s are still under development.

Nevertheless, for all their weaknesses, China's weapons development organizations represent far more than a zero base for future progress. Despite the disruptions of the Great Leap Forward, the cutoff of Soviet aid, and the Cultural Revolution, China succeeded in developing nuclear weapons and strategic missiles in the decade before the fall of Lin Biao. Since that time the Chinese have added a number of conventional weapons. These achievements suggest that some development and production of new weapons and equipment will take place well before completion of the industrial modernization program.

THE PLA OF THE FUTURE

Although China's defense modernization is still in an early stage and undoubtedly faces severe tests, the program is making limited progress. Some aspects of the program are already bearing fruit and others have been initiated. If China remains politically stable and can pay for and systematically assimilate foreign technology, it may achieve and maintain a steady pace of military modernization. For the near term, the PLA will continue to emphasize low-cost measures—such as improved training—designed to get more out of existing forces and equipment and introduce only a few new weapons into the inventory. After 1985, a combination of improved PLA training and increased defense output probably will begin to accelerate improvements in military capabilities.

Despite limited gains by 1985, however, the PLA still will suffer from serious material deficiencies resulting in large part from weaknesses in the defense industries. Problems in the aviation industry will continue to hamper improvements in the Air Force. Weaknesses in China's electronics industry will prevent the wide-scale introduction of new radars, sonars, and other electronic equipment. Tactical mobility and logistical support will continue to be hampered by shortages of vehicles and by limited capacity for repair and maintenance. And although new ground force equipment such as air defense and antitank missiles will appear in limited numbers, their production will fall far short of PLA needs.

After 1985, progress in the overall economic modernization program probably will result in marked improvements in force capabilities, provided that the defense industries become able to more nearly meet PLA requirements for weapons and equipment. Emphasis on the ground forces will continue, and the numbers of modern weapons in the ground force inventory will increase substantially. Mobility will improve somewhat through greater numbers of wheeled vehicles and some tracked armored vehicles. China's fleet of fighter and transport aircraft will grow modestly, and improved radars and more electronic equipment will be deployed.

China's defensive capabilities will be significantly improved by 1995 if political stability, economic growth, and scientific and industrial modernization continue unobstructed. Even with steady improvement in forces and defense industries over the next 15 years, however, China will not develop an offensive capability against the USSR, largely because of that country's vastly superior industrial base. With a population that is expected to reach 1.3 billion by 1995, China is unlikely to develop forces based on technology rather than manpower or to abandon its defensive doctrine of "People's War Under Modern Conditions," which posits defeat of a technologically superior enemy by using overwhelming manpower to defend China's vast terrain.

China's Armed Forces

Ground forces: 3,500,000 men:	
Tanks	7,000
Other armored vehicles	1,500
Major artillery pieces	14,000
Air and air defense forces: 450,000 men:	
Fighters	4,500
Bombers and ground attack	1,000
Surface-to-air missile sites	100
Navy: 350,000 men:	
Major surface combatants	25
Minor surface combatants	500–1,000
Submarines	100
Strategic missile forces: 100,000–200,000 men:	
ICBM's	(1)
MRBM's and IRBM's	100

(1) A few.

CHINESE DEFENSE SPENDING IN TRANSITION

By Ronald G. Mitchell*

INTRODUCTION

China announced in February of 1981 the start of a program of "further economic adjustment" that calls for a reduction in the current national budget, including defense funding. The program also entails a restructuring of the economy toward light industry and a reemphasis on centralized investment decisions. In light of China's worsening economic situation, and the new economic program's shift in priorities away from defense-related industries, the cut in the defense budget may portend a period of lower defense spending lasting several years.

This article discusses the circumstances connected with the reduction in defense spending, its implications for defense modernization, and presents defense spending projections through 1985.

BACKGROUND

Since Mao's death in September 1976, China's leaders have made economic development their primary focus with ideological considerations secondary. This shift away from the previous ideological orientation has not been easy or smooth. After a short transition period, China launched in early 1978 a ten-year economic reform and development program, which soon proved to be overly ambitious. It was replaced a year later by a three-year economic adjustment program, which apparently now in turn is being replaced by a new program of "further economic adjustment."

This latest economic adjustment program is intended largely to remedy economic problems stemming, in part, from new policies introduced in the three-year economic program. The problems include sizable deficits in the national budget and unacceptably high rates of inflation which resulted from a loosening of central government control over credit and pricing policies. The Chinese hope that by trimming the national budget, recentralizing investment and pricing decisions, and producing more consumer goods the latest program can ease inflationary pressures and bring about greater economic stability.

Throughout each of these economic programs, development of a modern defense establishment has remained a fundamental long-term objective, but an objective secondary to broad progress in the overall economy. The development and production of substantially more modern defense equipment is to be preceded by the building of an adequate industrial and technological base. The current emphasis on the development of light industry and on consumer goods production, moreover, suggests that under the latest program the development of the type of industrial and technological infrastructure needed for more modern defense output may be put off even further into the future.

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National Budget Announcement

In February, China's chief economic planner, Vice Premier Yao Yilin, unveiled a plan to trim the national budget and fight inflation. The plan would balance the state budget by cutting expenditures 13 percent from 112 billion yuan, which was approved September 1980, to 98 billion yuan. His report also indicated that defense and capital investment were the principal areas to be cut.[1] The cut in capital investment funding presumably could affect new investment and renovation in both civilian and defense production facilities.

The initial public releases of Yao's speech specified no separate figure for national defense in the revised budget.[2] But a subsequent compilation of China's revised budget data by the US State Department reports a figure of 17.5 billion yuan for defense. This is 3.3 billion yuan or 16 percent less than the 1980 budget.[3]

Analysis of the Defense Budget

The meaning of the announced defense budget is clouded by uncertainties of what defense activities are included or what may be covered elsewhere in the national budget. The Chinese only began in 1979 to publish data on their national budget after a hiatus of 20 years (see table). So far the Chinese have released data on the defense budget only for the years 1977 through 1981 but without explaining what defense activities are included in the budget line.

CHINA: COMPARISON OF OVERT DEFENSE BUDGETS AND ESTIMATED TOTAL DEFENSE SPENDING

Defense spending	1977	1978	1979	1980	1981
People's Republic of China budget[2] (in billions of yuan)	14.9	16.8	22.3	20.8	17.5
Estimated total[3] (in billions of constant yuan)	40.0	41.0	45.0	42.0	37–39.0

[1] Figures for 1981 are preliminary.

[2] Definition of activities included unknown but may only be an operating budget; presumably the figures reflect current prices. Budget figures for 1977–78 are from FBIS, July 3, 1979. Data for 1979–81 are from the American Consul General, June 29, 1981.

[3] Includes costs for military procurement, construction, research and development, personnel, and operation and maintenance activities; the estimates are in constant 1974 yuan.

Principal categories such as military research and development and capital construction probably are covered elsewhere in the national budget. Even so, U.S. estimates of Chinese defense spending which are based on direct costing[4] and include military research and development, weapons and equipment procurement, construction of military facilities, and operations, suggest that the official budget data are only large enough to encompass procurement of military weapons and equipment or defense operating costs, but not both.[8] The trends in the announced budget data, however, roughly parallel those of the direct cost estimate.

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[1] FBIS, Mar. 9, 1981, pp. L6–L18. (XINHUA, Mar. 7, 1981).

[2] The published text indicated only a combined cut of 6.4 billion yuan for defense, subsidies, and administrative expenditures. Ibid. p. L11.

[3] American Consul, Hong Kong, June 29, 1981.

[4] See appendix for an explanation of the direct costing methodology used to estimate total Chinese defense spending.

IMPLEMENTATION OF THE BUDGET CUTS

Whatever the size of the total PRC defense spending, the large magnitude of the cuts suggests that the application will be broad, affecting most major categories of defense expenditures. A cut of several billion yuan cannot be accomplished by singling out one or two programs, although one would expect some areas to be less affected than others. For example, strategic offensive missile programs probably would have little or no reductions because the investments in these programs largely have been made already and their limited deployment adds little to overall defense costs. Similarly, some limited introduction of selected new ground weaponry may also be considered a cost effective way to achieve some modest conventional force improvement.

Such a large reduction in defense spending probably will not be realized in a single year. A certain inertia exists in defense programs which is difficult to reverse immediately and the full implementation of the cost-cutting measures may require two or three years. For example, a massive demobilization of troops would best be undertaken over several years. Campaigns to cut back various operating expenditures also might take some time to bear fruit.

A HISTORICAL PERSPECTIVE

Cutbacks in Chinese defense expenditures are not new. An analogy to the present cut in defense spending can be found in the 1972 reduction (see figure). After rising rapidly from 1965 to 1971, defense spending, as estimated using direct costing, was reduced by about 15 percent in 1972 before resuming a pattern of slow growth of 1 or 2 percent a year. The abrupt shift in 1972 was coincident with a change in political leadership and a new economic policy that gave greater priority to general economic development. Modest growth in defense spending resumed again the following year, however.

Another example is the 13 percent cut in planned defense spending for 1980 from the previous year. That reduction could be interpreted, however, as a return to a more normal level of spending activity following the 1979 Sino-Vietnamese war.

FUTURE SPENDING TRENDS

For a variety of reasons, the cuts proposed this year probably will not be reversed for several years. The economic problems that precipitated the cut in defense spending this year will continue to exert downward pressure on defense spending. China's present leaders appear to understand that they must correct fundamental weaknesses in the pattern of economic development before the country can produce truly modern weaponry in quantity.

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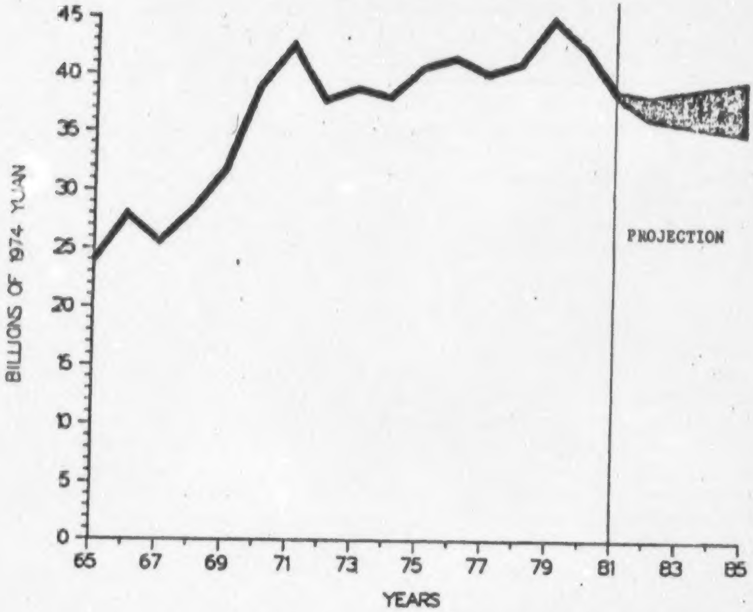
[8] See CIA NFAC Research Paper SR 80-10091 (U), July 1980, "Chinese Defense Spending, 1965-79."

ESTIMATED CHINESE DEFENSE SPENDING, 1965–1985



The long-lead times that are a common characteristic of modern weapon acquisition programs also will have a limiting effect on the defense budget. China's military research and development programs have been somewhat moribund over the past few years; relatively few new systems have completed development and are ready for series production. To develop—or acquire from abroad—new weaponry is a long-term process that would not bear fruit for some time and consequently will not be reflected in defense spending over the next few years. Moreover, the task of training officers and troops in the use of new sophisticated equipment in the quantities needed to make a difference would be a large undertaking lasting several years.

Given these factors, Chinese defense spending over the next five years is likely to fall within the range of the projections shown in the figure. China will probably emphasize making better use of existing equipment, more intensive training, and a restructuring of forces to use its large military manpower resources more effectively. Additionally, increasing attention will likely be devoted to ideological discipline to ensure loyalty and PLA support for the new economic policies.

The lower bound of the projection assumes that the full amount of the reductions discussed by the Chinese will in fact be implemented. Under this projection personnel strength would be cut by one million men over two years [6] as superfluous and inefficient personnel are discharged from the PLA. Fewer, but higher quality recruits would be accepted into the military as replacements.

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[6] Such a large cut was reported by the Japanese KYODO news service last February See FBIS, Feb. 20, 1981, p. L3.

The lower projection also assumes that procurement will undergo a 10 to 15 percent drop in the next two years and continue to decline gradually through 1985. A drop in procurement of this magnitude is consistent with the evidence that civilian products now are preempting a large and increasing share of the output value of China's defense industries.[7] The leadership appears to have decided that the inventories of the older, obsolescent systems that China currently produces are sufficient. And significantly better follow-on systems to replace the older equipment do not appear to be currently available. This is particularly true in the area of aircraft where large-scale production of more modern equipment is at least a few years away.

Operations and maintenance expenditures also are projected to decline as the size of the forces fall and as various cost savings programs are implemented.[8] Expenditures for military construction fall in this projection by 30 percent by 1982 as suggested by the size of the reduction in the capital construction budget.

The higher projection assumes that the defense reduction program follows the path of many other Chinese campaigns and it not fully implemented. In it the initial cuts are less severe and spending turns back up by 1983. For example, manpower is assumed to be reduced only by about 500,000 men and construction by only 20 percent in 1981 before leveling off. Procurement after declining about 10 percent is assumed to rise at a rate of 2 or 3 percent a year starting in 1983 as new follow-on systems begin to enter the forces. Conceivably, new replacement weapons systems, some of which may be acquired from abroad, could spur procurement expenditures in the mid- and late-1980s.

Actual defense spending trends will most likely be closer to the lower bound. While the approach outlined above is simplistic and the projections preliminary, these projections help to illustrate that China is not now, nor will be soon, in a position to allocate large additional resources to defense. On the other hand, the continued maintenance of China's large standing forces will limit the amount that can be pruned from the defense budget unless some very radical changes in Chinese defense philosophy take place.

Even with the proposed cuts in spending, the forces will continue to be large. China's ability to project forces outside its boundaries, however, will continue to be circumscribed by longstanding deficiencies in weaponry, mobility, and logistics. At the same time, the Chinese expect that their large manpower-intensive forces and a small but growing nuclear arsenal will continuue to deter external attacks.

Meanwhile, within the limits of China's current economic and technological capabilities, selected new weapon systems probably will be acquired or developed to make China's deterrence capability more credible. For example, China may choose to concentrate its force improvements in two or three specific areas such as strategic missiles, air defense, or antitank capabilities. Procurement of new weapons and equipment—particularly from foreign sources—will be limited and will focus on low-cost solutions to China's most critical military deficiencies.

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[7] See FBIS, Aug. 14, 1980, p. L1; FBIS, Apr. 2, 1981, p. K15–16; and People's Daily, Apr. 24, 1981.

[8] See FBIS, Jan. 28, 1981 for a call by the Party's Military Affairs Commission for the PLA to reduce expenditures for several O. & M. activities.

APPENDIX

DIRECT COSTING METHODOLOGY

The direct cost estimates of Chinese defense spending are based on a building-block methodology similar to one which has been developed over many years to assess the defense costs of the Soviet Union. The method begins by compiling a detailed list of the activities and physical components of the country's defense program each year. This list includes data on manpower, equipment procurement, order of battle, research and development activities, facility construction, and operating practices of the military forces.

These force components and activities are then costed to produce monetary estimates. For some components yuan cost factors are available; for each of the remaining items, the estimate is based on what it would cost if the items were produced in the United States and then converted to yuan using suitable yuan-dollar ratios.

Several different conversion ratios are used to reflect the relative differences in the U.S. and Chinese price structures. For example, if there are no yuan price data available for a particular PRC fighter aircraft, that aircraft cost is estimated in dollars and converted by a yuan-dollar ratio which is believed to reflect the relative costs in the aircraft industries of the two countries. The ratios are based on an extensive sample of prices for comparable U.S. and Chinese industrial products or services. The ratios range from about 9 to 0.5 yuan per dollar; the ratio at the high end of the range is applied to some electronic equipment and that at the low end to transportation services.

Once the cost of the major equipment items are obtained, they are grouped into separate program accounts. The program accounts are focussed around particular types of military units such as fighter aircraft units, ground forces divisions, and ICBM units. Any other costs associated with these programs such as personnel, operations and maintenance, and other hardware required by them are then estimated. The total program costs also include expenses related to training, facility construction, medical, and publication services.

The individual program costs are then organized into mission, service, or functional or geographic aggregates. Some costs of common concern such as research, development, testing, and evaluation (RD&TE), rear service activities, and headquarters management functions are estimated as single budget entries. In sum, the total direct cost is based on literally hundreds of separate cost calculations representing the definable activity that may be part of China's defense program.

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